Report
of the
Agricultural Department,
Eastern Bengal & Assam
1906-07 to 1914-15

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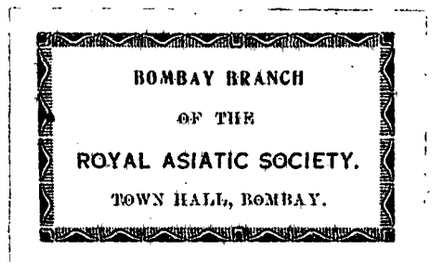

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REPORT

OF THE

AGRICULTURAL DEPARTMENT,
EASTERN BENGAL AND ASSAM,

FOR THE YEAR

1906-1907. to 1914-15

132930

BY

S. G. HART., Esq., I.C.S.,

DIRECTOR OF AGRICULTURE, EASTERN BENGAL AND ASSAM.

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FROM

S. G. HART., ESQ., I.C.S.,
DIRECTOR OF AGRICULTURE, EASTERN BENGAL AND ASSAM,

To

THE CHIEF SECRETARY TO THE GOVERNMENT OF EASTERN BENGAL AND ASSAM.

Shillong, the 28th October 1907.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1907, the first year of its existence as a separate department. I regret the delay in submission which has been due partly to delay in receipt of some reports from local officers and others not subordinate to the department and partly to pressure of work in my office.

2. The Annual Reports of the Agricultural Stations under this Department are being published separately.

I have the honour to be,

SIR,

Your most obedient Servant,

S. G. HART,

Director of Agriculture, Eastern Bengal and Assam

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REPORT

OF THE

DEPARTMENT OF AGRICULTURE, EASTERN BENGAL AND ASSAM

FOR THE YEAR ENDING

30th June 1907.

CHAPTER I.

INTRODUCTORY REMARKS.

Mr. H. C. Barnes, I.C.S., and Mr. N. D. Beatson Bell, C.I E., I.C.S., were in charge of the Department, as a branch of the Department of Land Records and Agriculture, from the 1st July to the 24th October 1906 and from the 25th October to the 10th February 1907, respectively. A separate appointment of Director of Agriculture having been created, I was appointed to that post, which I held from the 11th February till the end of the year.

2. Including the inspection of settlements Mr. Barnes and Mr. Beatson Bell were on tour for 43 and 96 days, respectively. Mr. Barnes inspected the Farms at Rangpur and Dacca and visited Chittagong in connection with the registration of traffic at that port. Mr. Beatson Bell visited Rangpur, Rajshahi and Dacca Farms. I was on tour for 94 days and visited all the Government Farms and also the private farms at Itakhola (Sylhet), Gauripur (Mymensingh), and Krishnapur (Silchar). I attended the Bogra Exhibition and inspected the Veterinary dispensaries at Chittagong, Dacca, Bakarganj and Sibsagar and the Traffic Registration Office at Dhubri. In company with the Assistant Director and the Fibre Expert I also attended the third annual meeting of the Board of Agriculture, which was held at Cawnpore on the 18th February 1907 and following days.

Assistant Director.

3. Rai Bahadur B. C. Basu, the Assistant Director of Agriculture, was on privilege leave from 13th August to 13th October 1906, and on special duty from 26th October to 31st December 1906, in connection with the Industrial Exhibition at Calcutta. During the rest of the year he was on tour for 117 days, exclusive of the days on which he visited the Upper Shillong Farm and Fruit Garden. He constantly inspected all the Farms under the Department besides some private farms and the experimental cotton field on the Baikuntapur Farm at Itakhola.

The miscellaneous agricultural enquiries which occupied a considerable portion of the time spent by the Director and Assistant Director on tour are too numerous for separate mention.

Fibre Expert.

4. As Fibre Expert to the Government of Eastern Bengal and Assam, Mr. R. S. Finlow, B. Sc., joined this Department on the 3rd July 1906. He visited the Jorhat Farm and spent some time in the Assam Valley and Cachar in order to ascertain the possibilities of an extension of jute cultivation in those parts of the province.

Agricultural Supervisor.

5. Pending sanction of the Government of India to the appointment of Agricultural Supervisors, Babu Hiranya Kumar Das Gupta, Sub-Deputy Collector, was placed on special duty under this Department. He joined on the 6th December 1906 and during the remainder of the year was in charge of the routine office work at headquarters.

Reorganization of the Department.

6. The proposals for the reorganisation of the Department embodied in a memorandum drawn up by Sir Bampfylde Fuller, of which a copy was appended to last year's report, were generally approved by the Government of India. An Economic Botanist and an Agricultural Chemist have been sanctioned for this province and they are expected from England next cold weather.

7. The Central Farm at Dacca will be the headquarters of the expert staff of the Department. Buildings for the accommodation of these officers and their subordinate staff are in course of construction.

Expert staff.

8. The administration of the Veterinary Department was entirely in the hands of the Director until almost the close of the year, when Mr. W. Harris, M.R.C.V.S., became Veterinary Superintendent of this province. A report on the Veterinary work of the year has been published separately.

9. Towards the close of the year a number of unofficial correspondents were appointed all over the province. Each has agreed to send regularly to this Department reports on all matters affecting crops. In return he will be supplied with all information likely to be useful to the agriculturists of his neighbourhood. Some of the Honorary correspondents have also been selected as Associates of the Department. An Associate is an honorary expert agriculturist who agrees every year to make a comparative demonstration of the advantages of some agricultural method new to the locality. The demonstrations are confined to such methods as, judging from repeated experiments on Government and private farms, can be confidently expected to give improved pecuniary results, without involving heavy initial outlay. The demonstrations taken up at present have been fully described in Bulletion No. 16 issued by the Department.

Honorary Assistants.

10. It is largely through the honorary correspondents and agricultural Associates that the Department hopes to disseminate useful agricultural knowledge and to receive timely information of all pests, blights, and other calamities affecting crops, with a view to taking such steps as may be possible towards devising remedies.

11. The Department will evidently be under deep obligations to its honorary assistants. The agricultural Associates, in particular, will be voluntary public servants of no mean degree; for they, by their own personal efforts, will be extending knowledge which will enhance the material prosperity of their neighbours and thus they will become public benefactors by example as well as precept. The list of Associates already selected will be found in Appendix No. I. It is intended to extend the number gradually till there is practically one for every *thana* and outpost, but progress is to be made cautiously and some years will elapse before this new departure is fully developed. The number of Honorary correspondents appointed by the end of the year was 26.

CHAPTER II.

SCIENTIFIC AND LOCAL ENQUIRY UNDER IMPERIAL CONTROL.

12. During the year botanical specimens of various plants were sent to the Reporter on Economic Products to the Government of India. Among these the most important were *Coptis teeta*; *Cinnamomum cassia*; and *Allium tuberosum* (U Jyllang).

Economic collections.

CHAPTER III.

SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL CONTROL.

13. Caravonica cotton, seeds of which were distributed in April 1906 to farms and persons interested in cotton cultivation in different parts of the province, failed everywhere except at Nowgong and at a village called Dhap in Rangpur, where the trees seem so far to be promising. A small proportion of the plants grown at the Jorhat Experimental Station is healthy and vigorous but only one or two bolls of cotton were produced during the year. At the Tropical Plantation, Wahjain, no yield was obtained this year and the plants are in a miserable condition. The Raja of Gouripur in Goalpara succeeded in growing some trees, but all of them died from the effects of flood last year. In some of the experiments the seed failed to germinate or the plants died prematurely. In many places the plants are reported to be alive, but are not healthy. The trials of Caravonica cotton are not yet conclusive, but they certainly indicate that this variety is not likely to thrive as a field crop in Eastern Bengal and Assam.

Cotton experiments.

14. Two hundred pounds of Dharwar American cotton were procured in April 1906 for the Manager of the Tepa Estate in Rangpur from the Bombay Agricultural Department but the results of the experiment have been very disappointing.

15. With a view to ascertain whether an improved variety of cotton can be raised on the low hills bordering Hill Tippera, experiments were started during the year at a private farm situated on the hilly land close to the Hill Tippera frontier of Sylhet, under the supervision of the Assistant Director.

A piece of land measuring a little over one *bigha* ($\frac{1}{3}$ acre) has been selected for the purpose. The following varieties of cotton have been sown:—

(1) Dharwar American.
(2) Buri kapas.
(3) King's Improved (American).
(4) Caravonica (three kinds).
(5) Spence cotton.

The seed of the above five varieties was obtained from or through the Inspector General of Agriculture; seed of Buri kapas came from Bengal and of Dharwar American cotton from the Bombay Agricultural Department. Sowing took place at the end of April. The plants came up well, but some were washed away by heavy rain in June. The vacancies thus caused were filled up by spare plants. Fish manure was applied to all the plots. Towards the close of June a few plants were damaged by insect pests, but on the whole the crop was then doing moderately well.

Jute Experiments.

16. With a view to encourage the spread of jute cultivation in Upper Assam by practical demonstration, two jute cultivators were supplied to (1) Mr. Forbes of Badlipar tea estate in Sibsagar, and (2) Mr. Christie of the New Cinnatoliah Tea Company in North Lakhimpur. One maund of jute seed was supplied to the former and $2\frac{1}{4}$ maunds to the latter from the Rajshahi Experimental station.

At Badlipar an area of 70 bighas (=3 acres) of land was sown with three maunds of seed. The condition of the plants was reported early in August to be fair, though weeds had stunted their growth.

Mr. Christie was supplied with seed for 20 acres of land, but he reports that in consequence of the late arrival of seed, and partly owing to heavy rain, only 5 acres of land could be sown in the middle of April. A further area of $10\frac{1}{4}$ acres was sown in the third week of May. Some land had to be re-sown as the seed rotted. Hairy caterpillars also damaged the young plants. The crop was expected to yield a good outturn on the high land plots of the earlier-sown area, but only a poor return on the remainder.

17. A number of private individuals in Sibsagar, Lakhimpur, and Kamrup, obtained jute seed from or through this Department. The experiments in two cases are reported not to be very successful, owing to the crop having been grown on worn-out sugarcane and thatching grass land. In the remaining cases the crop was reported early in August as growing fairly well.

18. During the year the authorities of the Assam-Bengal Railway expressed a desire to conduct jute experiments through their station masters along the line. Mr. Finlow toured along the railway from Gauhati to Dibrugarh and recommended the growing of jute at certain selected stations, for which one maund of seed in all was supplied from the Rajshahi Experimental station.

The District Traffic Superintendent, Lumding, reports that the weather conditions have not been altogether favourable, especially owing to a deficiency of rain in August. At most stations the crop has been sufficiently successful to justify the belief that, with experience and care, jute can be grown anywhere in Upper Assam, unless weather conditions are specially unfavourable. When the crop failed it was, the District Traffic Superintendent considers, due to the selection of land which was either too high or too low and in some cases too near to jungle harbouring deer.

19. As in other parts of the province, the high prices of jute which have been prevailing for some years past, have induced the cultivators in Assam also to take up jute cultivation more largely and the people have begun to appreciate the value of this crop. Jute cultivation is rapidly spreading up the Brahmaputra Valley and the number of cultivators who come from Eastern Bengal and take up land for jute cultivation in Goalpara, Darrang, and Nowgong districts is continually increasing. Two jute farms under European management have been opened in Kamrup and experiments are also being made by European planters in Cachar and all other tea districts of Assam.

20. Jute seed grown on Rajshahi farm was distributed to selected cultivators and zamindars in that district. The results of these experiments have not yet been reported.

21. A gentleman in Mymensingh made experiments on a small scale with jute seed supplied from the Rajshahi Experimental station. He reported in August that the area cultivated promised to yield a very satisfactory outturn and the plants have made excellent growth in comparison with the crop on the surrounding plots grown from seed indiscriminately gathered.

22. Pending the construction of laboratory buildings for the expert staff at the Dacca Central station, Mr. Finlow's headquarters are at Pusa where he has made temporary arrangement for laboratory work and for conducting various experiments with jute and other fibres. It has also been arranged that Mr. Finlow will make occasional visits to other provinces where jute experiments are in progress and give any advice in the matter that may be required.

At the Rajshahi Experimental station the cultivation of jute and Malancha (Malacra capitata) and at the Jorhat Experimental station some trial sowings of jute were conducted under the directions of Mr. Finlow. He also inspected the jute experiment started by the Tarrapore Tea Company in Cachar and advised the Honourable Mr. R. H. Henderson, C.I.E., the Superintendent of the Company, in regard to the cultivation of the crop.

All other points affecting Mr. Finlow's work during the year have been adequately dealt with in his report which forms appendix No. II to this report.

Wheat experiments.

23. Experiments with wheat, with a view to introduce the cultivation of this crop into the Assam Valley, have been made annually since 1903-1904. Some of these experiments have been attended with a fair measure of success and others have failed. Arrangements were made for the conduct of a limited number of experiments during last cold weather in Kamrup, Darrang and Sibsagar. Six maunds, four seers of seed wheat obtained from Dumraon in Behar were distributed for the experiments.

In Kamrup 2 maunds 4 seers of seed was given out to ten persons, but the crop was totally damaged by hailstorms.

In Darrang two persons were given 1½ maunds of seed. The crop grew well at first, but owing to rain in the latter part of the season it gave little or no outturn.

In Jorhat (Sibsagar), out of twelve persons to whom 2½ maunds of seed were distributed for trial, only two obtained a fair outturn, and in the remaining experiments, the crop gave very poor results in consequence of hailstorms and other causes.

24. The unfavourable results obtained and the fact that previous experiments have led to no appreciable extension of wheat cultivation in the localities where the experiments were made, are a sufficient indication that wheat has no chance of becoming a staple crop in the plains of Assam. The climate is too humid and there is usually too much rain in March and April, which spoils the crop at the time of ripening or when it is about to be reaped. The Nambor forest may be more suitable because it has a drier climate. It is therefore not intended this year to distribute wheat seed to any place except Lumding where arrangements for an experiment have been made.

AGRICULTURAL STATIONS.

25. The agricultural stations at Rangpur, Rajshahi, Jorhat, and Upper Shillong, the Tropical Plantation at Wahjain and the Shillong Fruit Garden continued to work throughout the year. The annual reports of these stations have been written by the Assistant Director and have already been published separately.

Dacca Central Farm.

26. Land was acquired for the Central Farm at Dacca and part of the area was reclaimed from jungle. The erection of cattle sheds and a godown is almost complete. A commencement has been made with the marking out of fields of equal size and approximately equal fertility, but the land will not be in a suitable condition for experimental purposes before some two years hence. Residences for the farm staff are under construction. The working cattle and implements have also yet to be obtained, the purchase of suitable cattle being a matter of considerable difficulty in that neighbourhood. The farm has been enclosed with a wire fence of a total length of about 4 miles.

Rangpur Agricultural station.

27. The site of the existing Rangpur station having been pronounced unsuitable for tobacco research by Mr. Sly, Officiating Inspector General of Agriculture in India, a site for a new tobacco station at Burirhat was selected and steps taken for the acquisition of the land. Schemes for the laying out and stocking of the new station has been prepared and measures are being taken to give effect to them. The land is at present fallow. The present Rangpur farm will be retained up to the end of July 1908, after which it will be handed over to the Rangpur Agricultural Association.

Samples of tobacco grown and of cigars and cigarettes manufactured on the Rangpur Farm were sent through the kind offices of the Director General of Commercial Intelligence to various firms in India. The valuations received are unsatisfactory, though it is recognised that they may be not altogether unprejudiced. The want of

a properly constructed curing house is of course a serious defect, and when this is supplied it is hoped that tobaccos of first class quality may be produced. The want of a fully qualified expert with American experience will, however, continue to be a serious drawback. Under the circumstances, there would seem to be a more promising line of experiment in the direction of the production of a tobacco suitable for the manufacture of cheap cigarettes. It is hoped that this question will be taken up during the ensuing year.

Rajshahi agricultural station.

28. The best results obtained on this farm were with Dacca *ganderi* sugarcane which gave a splendid outturn. There is now a great demand for sets from the surrounding cultivators. A certain number will be distributed, but the experiment with this variety of cane will first be continued for at least another year before it is considered advisable for the Department to confidently recommend it for general cultivation. When this can be done, measures will be taken to produce a supply of sets sufficient to meet all demands.

Jorhat agricultural station.

29. Though this is intended to be mainly a sugarcane station, none of the varieties cultivated yielded as well as the *ganderi* on Rajshahi Farm. Allowance has to be made for the fact that the soil of the Jorhat Farm is poor and has only recently been reclaimed from grass jungle. Under the advice of Dr. Mann, late Scientific Officer of the Tea Association, a very elaborate programme of work has been arranged for the current year. This includes a detailed record of the field character of each clump of cane at all stages of growth.

Khasi Hills stations.

30. The two Upper Shillong Farms are devoted mainly to market gardening experiment. During the year proof was given of the large profits to be obtained from the cultivation of strawberries, rhubarb, asparagus and a variety of squash imported from Madras.

In potato cultivation the advantage of oil-cake manure and of spraying with Bordeaux mixture were demonstrated. The cultivation of lemon grass and the distillation of its oil seems at present to be the most promising experiment on the Tropical Plantation at Wahjain.

31. Two Khasia gentlemen have undertaken rhubarb and asparagus demonstrations. An account of these demonstrations will be found in the Annual Report of the Fruit Garden, Shillong.

English pigs.

32. The experiment of breeding English pigs at the Upper Shillong Farm with a view to the improvement of local stock has proved a failure. When the herd was started no attempt seems to have been made to select a breed which might be expected to do well in these hills. Khasias have found these pigs more expensive to keep and they also put on flesh less easily than their own pigs. Under the circumstances it has been decided to dispose of the whole herd.

Cattle-breeding.

33. The breeding of Patna cattle and of a cross between Patna and Khasia cattle is making satisfactory progress and a brisk demand for young bulls of these breeds has arisen amongst the Khasias. Seven young bulls were sold during the year at prices between Rs. 10 and Rs. 20 per head. The Farm is unable to meet all the requisitions received for young bulls. It has been decided not to sell heifer calves at present, but to retain them all for increasing the Farm herd.

AGRICULTURAL EXPERIMENTS IN GOVERNMENT WARDS AND PRIVATE ESTATES, ETC.

Rajshahi Division.

34. No satisfactory results were obtained from any of the agricultural experiments carried out in Wards' estates of Dinajpur, Jalpaiguri, and Rajshahi districts, except in the cultivation of Nainital potatoes, Buxar wheat and jute in the Baikunthapur Ward's estate in Jalpaiguri and of Patna potatoes in the Patichora Ward's estate in Dinajpur. In Bogra the results of experiments with Patna potatoes and Indian-corn were fairly satisfactory. Banga cotton, the seed of which was obtained from Alipur Duars; and cultivated in Jaipur Government estate, gave a very good outturn. Some experiments with Egyptian, Sea Island, and Garo Hills cotton carried out by private individuals are reported to have been successful. It is further reported that, as a result of previous experiments, the cultivation of several fine varieties of paddy and jute has been adopted by cultivators in this district.

35. In one of the several Wards' estates in Chittagong, small experiments were made with sugarcane, chillies and English vegetables. In another estate English vegetables only were tried. No record of outturn was kept for the vegetables, but the chillies and sugarcane did fairly well, though injured by drought and white-ants respectively. Experiments made with potatoes, peas, and sugarcane in the Noakhali Government estates were all failures.

Chittagong Division.

CHITTAGONG MODEL FARM.

36. An account of the year's work on the Chittagong Model Farm has been received just as this report was going to Press. The following is a summary.

Experiments were made with 8 varieties of cotton. All gave very poor results. The best was Chittagong local, which yielded at the rate of 30 seers per acre, the next was Dharwar which gave only 26 seers per acre.

Jute, of the Serajganj Deswal variety, also gave a poor outturn—only a little over 10 maunds per acre, though the land was manured.

Two varieties (Chiknal and Bailam) of local *aus* paddy were tried against the fine *aus* of the Central Provinces and Kiushu of Japan. The experiment was of no value, because the manurial treatment of the different crops was not identical. The two foreign varieties were also damaged by rain and blight and gave very poor yields, though the local varieties did well.

Three varieties (*Badshabhog*, *Maniki-madhuri* and *Dadkhani*) of *aman* rice from Burdwan were tried against the local Rasail, all the plots being manured with cow-dung only. The local variety yielded 19½ maunds per acre, the others 6½, 10¾ and 5 maunds only.

The effect of green manuring with cowpea was tried on 4 varieties of *aman* paddy. The local paddy was again far ahead of the others; but as its yield was only 10 maunds 23 seers per acre, the experiment gave only negative results.

Nainital potatoes on an irrigated plot yielded 56 maunds 38 seers per acre and on an unirrigated plot 36 maunds 26 seers. Both plots were manured with castor cake at the rate of 30 maunds per acre. The yield of the irrigated plot was *poor* and the cost of cultivation was high.

A ratooning experiment with *khari* sugarcane yielded only 15 maunds 5 seers of *gur* per acre on manured, unirrigated land. Dacca *ganderi* in a variety experiment did better, giving 26 maunds 30 seers on irrigated land. A mustard experiment produced only 1 maund 14 seers per acre on unmanured land.

Cabbages, potatoes, and other vegetables are said to have done well, but no details of outturn or cost are furnished.

The expenditure of the Farm during the year was Rs. 2,341-0-9 and the receipts Rs. 700-7-0. The balance is met by grants from *khas mahal* and Court of Wards' funds. It may be added that this Farm was not under the control of the Department. At one time proposals were made for the abolition of this Farm, but it has now been arranged that a portion of the Farm will be retained by Government for the cultivation of cotton and that the remainder will be leased out for five years, with a proviso that the lessee is to grow a certain quantity of *patal* and cotton every year.

37. No agricultural experiments were undertaken in the Government estates in the districts of Dacca and Mymensingh. The District Board of Dacca is reported to have entertained a sericulturist with the object of introducing *Eri* silk cultivation. Bone-meal, Patna and Nainital potatoes supplied to the Collector of Faridpur for experiments in the Government estates proved complete failures, the resulting crops weighing less than the seed used. In Bakarganj Government estates, experiments were made with Nainital potatoes and English vegetables with fair results. The cultivators are reported to be taking an interest in the cultivation of potatoes, though very few have taken up this crop on their own account. The fact is that a maximum yield of only five times the weight of seed used, which is all that has been attained in the experiments, is not a very strong inducement to raiyats, who are accustomed to much better profits from the crops they already cultivate.

Dacca Division.

Some small experiments with potatoes, country and English vegetables in Khontakhali Ward's estate in Bakarganj were rather more successful, potatoes returning seven times the weight of seed. A small jute experiment was made in the Dakhin Shahbazpur Ward's estate, but gave an outturn at the rate of only 11 maunds an acre.

GOURIPUR EXPERIMENTAL FARM.

38. A private farm has been in existence at Gouripur in Mymenisngh since 1901. It is maintained by Babu Brajendra Kishore Roy Choudhury, zemindar. The area is about 30 acres, of which 24 acres are under cultivation, including 2 acres reclaimed during the year. The most important crops grown on the farm are jute, paddy, sugarcane, and potatoes.

Jute was grown during the year non-experimentally. The yield obtained was only about 10 maunds an acre.

As a result of experiments with several varieties of winter rice, it has been found that the *Balam* of Bakarganj gives a better yield (9 maunds 23 seers per bigha) than Lohadang (8½ maunds per bigha) the most prolific variety of Mymensingh. The former is, moreover, a fine rice while the latter is coarse. This experiment will be repeated.

An experiment with Patna potatoes gave an outturn of 45 maunds per bigha. The value of the produce was Rs. 146 and the cost of cultivation Rs. 43-11-3 per bigha. The neighbouring cultivators are beginning to grow this variety of potato and 10 maunds of seed tubers have been sold to them from the farm.

Another experiment made with the local variety of potatoes contrasted the effects of thick sowing of small seeds with fairly thin sowing of somewhat larger seed. The latter method gave 24 maunds 30 seers against 18 maunds of the former. The larger seed also produced a greater proportion of big tubers. These have been preserved for seed and the process of selection will be continued.

Four varieties of sugarcane were tried, but all gave very poor yields owing to unfavourable conditions of weather, especially at the sowing season. The quality of *gur* produced in the Farm was, however, excellent. A three years' experiment with the *khari* variety of cane was concluded. The quantity of manure used was far too small, but nevertheless the total value of yield in the three years was Rs. 215, while the expenses of cultivation were Rs. 97.

Among the other crops tried on the farm experiments with three varieties of cotton all failed.

Surma Valley and Hill Districts.

39. No agricultural experiments were undertaken at Government expense in this division, except in the Lushai Hills, where the experimental cultivation of potatoes is reported to be very promising.

In Sylhet the cultivation of sugarcane has been extended and potatoes are now largely grown. The cultivation of pineapples, which are largely grown near Jaldup, is also reported to be gradually extending. The zamindar of Gouripur has started a farm at the foot of the Khasi Hills within the Sunamganj subdivision with the object of growing fruit trees of various kinds and cotton of different varieties. Maulvi Sayad Abdul Majid, of Sylhet, has lately opened a farm on which Spence's cotton has been sown. The plants are at present thriving well.

Brief accounts of the two private experimental farms in the division, *viz.*, the Baikunthapur Farm in Sylhet and the Krishnapur Farm in Cachar are given below :—

BAIKUNTHAPUR FARM.

40. This Farm belongs to Babu Baikuntha Kumar Nandi and Brothers, of Sylhet, and is situated near Itakhola station on the Assam-Bengal Railway. It was opened in April 1905 and the land was then almost covered with jungle. The area is 953 acres, consisting chiefly of a series of low hills, of which about 100 acres have been brought under cultivation.

The main object of the garden is to experiment with cotton, chiefly of the tree variety. Different tree cottons from Bengal, Central Provinces, Madras, Burma, etc., have been tried. Last year insect pests damaged the plants to a considerable extent and the yield was not therefore satisfactory. The plants were pruned in April last and they are now reported to be growing vigorously.

Besides cotton, experiments are being made in sugarcane, potatoes, ground-nut, wheat, barley, jute, rice and other crops suitable to the lower lands. Except in ground-nuts and sugarcane, the results were not very successful last year. A promising experiment is being carried on in the cultivation of lac on *Arhar* plants (Cajanus indicus). A large area has also been planted with orange trees, mangoes, jack fruit, lichis, plantains, and pineapples.

A plot of land in the Farm has been temporarily assigned to this Department by the proprietors for experimental cultivation of cotton as mentioned in paragraph 15 of this report.

KRISHNAPUR FARM.

41. This Farm was started in 1904 by Babu Man Gobind De Choudhuri. It is close to the town of Silchar and covers an area of 60 acres of low hills and slopes, of which about 30 acres are under cultivation. The crops now grown on the Farm are cotton, ground-nut, sisal hemp, *Mesta pat* (Hibiscus cannabinus), etc. There are also several varieties of fruit trees.

Cotton.

During the year five annual varieties of cotton were tried, but only Dharwar-American succeeded at all. The chief tree cottons being grown are Spence's and a hybrid of Egyptian and American. Both of these varieties have yielded satisfactorily, though pests and blights damaged the plants to some extent. There are also some trees of Caravonica cotton; these declined during the cold weather to a very poor condition, but with pruning in April they have revived. The Spence's Dharwar and hybrid cottons were also pruned in April last and the plants, especially Spence's, are now reported to be growing well. The proprietor exhibited some Caravonica and Spence's cotton produced on the Farm and was awarded a gold medal at the Industrial Exhibition held in Calcutta last cold weather.

Ground-nut.

Ground-nut was grown as a catch crop between rows of cotton and of fruit trees and did very well. No exact record of area and outturn was kept.

Fibres.

Experiments were made with *Mesta pat* (Hibiscus cannabinus) on low hills and the yield of fibre is reported to be excellent. Some plants of Salufa and Hibiscus mutabilis are also being grown with fair success. The cultivation of jute on hill slopes is also reported as promising.

Miscellaneous crops.

A few varieties of plantain and pineapple have been grown on the Farm for fruit and fibre. Fibre was extracted from leaf-sheaths of the former and exhibited at the Calcutta Exhibition. The proprietor extracted fibre also from Mautia Puya and Lakarati which in both cases has been reported on favourably by the Reporter on Economic Products to the Government of India.

Of the fruit trees, the most important are the oranges, of which there are some 200 trees, and all are flourishing. The lichi, sapota, mango, and loquat plants are also growing well, having received a liberal manuring with rotten fish.

There are two small plots of arrowroot and cassava on the Farm which have been successfully cultivated. Among the other experiments are Lesser cardamom, camphor lemon grass and vanilla. Four or five varieties of paddy were also tried with fair success, but no account of the experiments was kept.

Assam Valley Districts.

42. No reports of agricultural experiments have been received either from the Commissioner of this division or any of the District Officers except the Deputy Commissioner of Goalpara. The latter mentions some cotton experiments made by the Raja of Gouripur and in the Bijni estate, but no particulars have been supplied.

Seed potatoes supplied from Shillong last year to private gentlemen and others in the Assam Valley are reported generally to have given good results.

Seeds of a large variety of squash, which has been introduced into the Khasi Hills from Madras, were distributed in some parts of the Assam Valley and other places in the plains. The plants grew luxuriantly at first, but none set fruit. Evidently they are not suited to the plains though they have given excellent results in the Khasi Hills, where they are now highly appreciated.

General remarks.

43. In Eastern Bengal districts funds are provided for agricultural improvements in *khas mahal* and wards' estates, but it has frequently been found that expenditure has been limited to small and amateur attempts at market gardening which have yielded little or no practical results. To remedy this haphazard system of so-called agricultural experiments, the attention of local officers has been invited to a number of simple agricultural improvements which could be demonstrated without much difficulty, provided only that the authorities will take an interest in them and that the work is entrusted to a fairly capable cultivator. The further suggestion has been made that improvements to be of substantial benefit must affect the staple crops of the country, and that it is preferable to demonstrate new methods of cultivation which have by repeated experiments been proved to be profitable, rather than incur the risk of loss and failure by launching out into new experiments.

New agricultural implements.

44. No new implements of importance were tried in the province during the year. The Behea cane mill has worked well wherever it is used. Both the Sibpur and the Hindustan ploughs have given excellent results on Government Farms, but cultivators show no inclination to adopt their use. The fact is that their cattle are neither strong enough nor sufficiently well fed to be able to drag a deep plough. The Planet Junior hand-hoe, though very useful on some Government Farms, is not approved on others, and no cultivators have yet adapted it though it would seem eminently well adapted for potato and sugarcane cultivation.

Sericulture.

45. In Malda, Rajshahi, and Bogra, which are the important silk-producing districts of Eastern Bengal, the Bengal Silk Committee have continued to do useful work in popularising the use of healthy seed, extending mulberry plantations and starting model rearing-houses. The Committee employed five Sub-overseers in Malda and one in Rajshahi. Two Sub-overseers were also employed in Bogra by the District Board. These officers work under the direct supervision of the Committee's Superintendent, Mr. A. K. Ghose. It is quite evident that the advantage of Pasteur's system of examining silk worm moths is now appreciated by the rearers of Eastern Bengal. The Committee sell microscopes and other appliances to cocoon-rearers and its officers instruct them in the use of the microscope and examine seed for them.

In Bogra two private nurseries have been started during the year and some cultivators have had their rearing-houses built on improved lines. In Malda many rearers have microscopes and have learned thoroughly how to use them. Some of them also have rearing-houses of almost the best type. The method of rearing silkworms and the use of the microscope are taught in three of the middle vernacular schools in Malda by the Committee's Sub-overseers and the District Board contributes towards their pay. In this district rearers often find difficulty in obtaining pure seed and the Committee urge the establishment of nurseries as soon as possible. In Rajshahi the two nurseries established by the Committee have done well, the results of the seed distributed from them being satisfactory and both having shown a clear profit after paying all expenses.

A report of the work done by the Sericultural School at Rajshahi will be found in paragraph 52.

The experiments in the rearing of the European univoltine silkworm were repeated at the Fruit Garden, Upper Shillong, last spring and proved as successful as in the previous three years. But until sericulture is taken up in the Khasi Hills as a separate industry and on a larger scale, the profits obtainable cannot be definitely ascertained. A detailed report of the experiments will be found in the Annual Report of the Agricultural Stations published separately.

The whole subject of the revival of the silk industry in this province is under the consideration of Government. The remedial measures proposed are based on the recommendations of a Committee appointed in Bengal to consider the causes of the decline of the industry and to formulate proposals for its restoration.

Insect pests.

46. In October and November 1906 flights of locusts were observed in the districts of Pabna and Goalpara, in the Nator and Kishorganj subdivisions of Rajshahi and Mymensingh, respectively, in parts of Dinajpur and in the Khasi and Jaintia Hills. In April and May 1907, they appeared in parts of the district of Malda. The locusts caused no harm except in Malda and the Khasi and Jaintia Hills, where they damaged paddy crops to some extent.

During the year insect pests of other kinds were prevalent as usual throughout the province. In Dacca considerable injury was done to jute and paddy crops by a cricket pest. This was identified by the Imperial Entomologist as *Brachytypes achatamus*, Stoll., which is said to be a common pest over a large part of India. Mr. Lefroy suggested as a remedy the flooding of the affected fields and afterwards collecting and destroying the insects. The remedy is one which is not easy of application and, so far, it has not been tried in this province. In parts of the district of Sylhet a rice caterpillar locally known as *Katuya poka* seriously damaged the *boro* crop and specimens were sent to the Imperial Entomologist who reported that the insects were unknown and no preventive could be suggested. A similar species of caterpillar caused great injury to the rice crops in parts of Mymensingh, Kamrup, and Tippera. A serious pest known as *Pomari poka* (*Hispa anaescens*) mentioned in last year's report broke out again during the year in Bakarganj and did some damage to the *aus* crop. A specimen of an insect which was damaging the rice crop in Malda was sent to the Imperial Entomologist, who has identified it as the rice-stem borer and has advsed

that the only rational treatment is to pull out and burn all withered shoots of rice with the insects inside. A certain amount of damage was done by crickets and caterpillars to the jute crop in Sylhet and also in Nowgong and Kamrup where jute cultivation is new. Minor or unidentified pests of crops have also been reported from Faridpur, Noakhali, Rajshahi, Chittagong, Chittagong Hill Tracts, Garo Hills, Lushai Hills, Darrang and Lakhimpur. Specimens of these pests were sent in some cases to the Imperial Entomologist.

Entomological Collector.

47. Towards the close of the year an Entomological Collector, trained under the Imperial Entomologist at Pusa, joined this Department. His duties will be to acquire information regarding the life-history of various pests for submission to the Imperial Entomologist and, when possible, to assist cultivators in applying the preventive measures recommended by that officer. His headquarters have been fixed at Dacca, and he will work under the direct supervision of the Assistant Director of Agriculture.

Copies of Mr. Lefroy's "Indian Insect Pests" and of two leaflets on "Useful Insects" and "Household Insects" were obtained from the Imperial Agricultural Department and distributed among local officers.

Blights.

48. For several years past a blight affecting betel-nut trees has been very prevalent in parts of the district of Sylhet. In 1905 Dr. Butler, Imperial Mycologist, visited the affected area and enquired into the disease. A leaflet was published in Bengali on the lines of his report, suggesting certain remedial measures and circulated during 1905-1906 among betel-nut growers in the district, but not much practical result has been reported.

A serious blight has appeared within recent years among the orange trees on the southern slopes of the Khasi Hills. Dr. Butler sent his Assistant, Mr. S. K. Basu, to examine it. A full account of the disease will be found in the Annual Report on the Agricultural Stations in this province.

Crop-cutting experiments.

49. A report on the crop-cutting experiments, which have been made in all districts of the province during the quinquennial period ending the 31st March 1907, will shortly be submitted to Government.

CHAPTER IV.

AGRICULTUEAL AND INDUSTRIAL EDUC ATION.

Agricultural instruction.

50. Under arrangements made by the Government of Bengal, the Superintendents of the Rajshahi, Chittagong, and Rangpur Experimental Farms used to give agricultural instruction to boys of the local schools. This instruction not being associated with practical work, was of little practical use, and as agriculture is not a subject in the Entrance Examination, the boys took very little interest in it. The classes have now been discontinued.

In Rangpur the District Board offer ten scholarships of Rs. 4 each to sons of cultivators, but at the present time only one of these has been taken up and that by a little boy who is being taught cigarette-making by hand, but it is evident that he attends only for the sake of the stipend. I have advised the District Board that at present their money is being wasted and have suggested a scheme for providing a practical training for sons of cultivators. The scheme is on the same lines as one previously drawn up by the Collector of Rajshahi for the benefit of the sons of tenants of the Charani Ward's estate. The scheme has been approved and will, it is hoped, come into working during the current year.

Various measures for extending agricultural knowledge through the public schools have been under discussion with the Education Department. The Assistant Director of Agriculture has written for the Lower Primary School Reader, a series of lessons in agriculture, which give probably as much theoretical knowledge of the subject as can profitably be imparted to young cultivators. Arrangements for distributing seeds and starting flower and vegetable gardens at various classes of schools are being made by the Director of Public Instruction in consultation with this Department.

Deputation of students for agricultural training at Poona and Pusa.

51. Three students were sent in January 1907, at the cost of Government, to study agriculture at the Poona College of Science. They will go through a three years' course at Poona to be followed by a two years' post-graduate course at the Agricultural College at Pusa. Three more students will be sent to Poona during the ensuing season.

The Khasia, who was sent to Pusa for training under the Imperial Entomologist, has returned after going through a course of training for 9 months and has been appointed Entomological Collector under the Assistant Director of Agriculture and stationed on the Dacca Farm.

On the recommendation of the Imperial Agriculturist the Assamese, who was sent to Pusa in 1905 for training in general agriculture, has been appointed Farm Overseer at Dacca.

Rajshahi Sericultural School.

52. The Sericultural school which previously formed a branch of the Rajshahi Diamond Jubilee Industrial School, was detached, reorganised, and made a separate institution with effect from the 1st January 1907. Government has undertaken the entire support of the school and the expenditure incurred in connection with it will be defrayed from the budget of the Agricultural Department.

The school is now managed by a head master under the supervision of a Managing Committee appointed by the District Board of Rajshahi and subject to the general control of the Director of Agriculture. The school course extends over twelve months and the subjects of instruction comprise (1) proper methods of rearing and feeding silkworms, (2) use of microscope, (3) detection of silkworm diseases, and (4) methods of discriminating good from bad seed.

Twelve apprentices, who must be sons of parents actually engaged in silk-rearing, are to be taken annually for training in the school, and they will each receive a stipend of Rs. 5 per month. At the end of six months the students are examined, and any found unpromising are eliminated. The rest will, on passing the second examination held on completion of the year's course, each receive a microscope and a money grant of Rs. 250 to enable them to construct a rearing-house on approved lines.

The institution commenced its first session under the new *regimé* on the 15th January 1907. Twelve apprentices were appointed, three of whom subsequently left. As the apprentices joined late, the half-yearly examination was held after the close of the year under review. Of the ten apprentices six passed, two with credit.

The buildings which were formerly used for the sericultural school have been made over by the District Board to Government. In addition to them a model rearing-house is being constructed for the instruction of apprentices. The school plantation consists of 5 bighas of mulberry land, of which 3 bighas are under cultivation. The remaining area and another plot of land lately taken up will be planted shortly.

The total expenditure of the school up to the 30th June amounted to Rs. 1,672, including a sum of Rs. 642 advanced by the District Board. A sum of Rs. 481 was realised on account of sale proceeds of cocoons, of which Rs. 127 was credited to the District Board.

I am greatly indebted to Mr. H. C. Fraser of Kajla Factory and Mr. A. C. Ghose, Sericultural Superintendent, for the trouble they have taken in connection with the school. The Collector, District Engineer, and other members of the Committee have also taken a great deal of interest in the management of the school.

Since the close of the year two scholarships of Rs. 8 each per month, tenable at the Rajshahi Sericultural School, have been sanctioned by Government for two Khasia boys for 12 months, from the 1st January 1908.

Measures taken for improvement of hand-loom weaving.

53. It is to be regretted that the students who received instruction at Government expense in fly-shuttle weaving at Chinsurah during 1904-1905 and 1905-1906 are making no practical use of their training except one who, it is understood, has set up two looms in a village of Karimganj subdivision. The weaving institution started by private enterprise in the town of Sylhet, to which a monthly grant-in-aid of Rs. 10 was sanctioned from 1st May 1903, ceased to exist from December last. Five scholarships of Rs. 5 each per mensem were granted for a period of two months to five persons of the weaving community in Sylhet to learn the use of the fly-shuttle loom at the above mentioned institution; but only one stipend was actually awarded by the Deputy Commissioner.

Very little practical result accrued from the demonstrations of fly-shuttle looms at Sylhet and at Kallain in Cachar, to which places trained weavers were deputed for this purpose during the year. Only 8 men received instruction at Sylhet though many others came to look on. At Kallain in Cachar the Assamese settlers took no interest

in the matter, as they prefer their old looms. Some Bengalis, however, saw the loom and quickly learning to use it, bought it when it, was ultimately put up to auction, and when last heard from, were working it successfully.

54. At the beginning of the year under report, four students, three from Sylhet and one from the Khasi Hills, were sent to Chinsurah to learn the use of the fly-shuttle loom at the firm of Messrs. P. N. De & Co. Each student was granted a scholarship of Rs. 15 per mensem for a period of three months and travelling expenses both ways. Two of them returned home after finishing the full course of training but the other two, one from Sylhet and one Khasia, returned almost immediately after reaching Chinsurah. The training does not appear to have been satisfactory and has had no useful result.

55. During the year two trained weavers were obtained from Calcutta to demonstrate the use of the Salvation Army loom at the Flower Show held at Shillong on the 27th May. Unfortunately the Salvation Army loom, which was ordered from Gujerat, did not arrive in time and only the working of a Serampore loom could be demonstrated. The weavers were also retained for some further time in Shillong to give instruction to all who wished to learn weaving. As in the previous year, the Khasias seemed enthusiastic at first, as they do over every novelty, but none of them would take the trouble to really learn the use of the loom. Since the close of the year, the weavers with the Salvation Army loom have been sent to Jorhat at the request of the Exhibition Committee there. I have also obtained from Madras one of the new looms which is a modification of the Hattersley loom and is said to have been finally adopted in the Madras School of Arts after extensive experiments with various looms. A fly-shuttle loom, manufactured by a gentleman of Tippera district, has also been procured. These looms have been sent to Jorhat where experiments will be made to test their merits.

A report on measures already taken for the improvement of the hand-loom industry in this province will shortly be submitted to Government, together with proposals regarding the lines on which it seems probable that substantial results may be achieved.

CHAPTER V.

PUBLICATION OF AGRICULTURAL INFORMATION, ETC.

Agricultural publications.

56. The usual preliminary and final forecasts of the various staple crops of the province and the annual volume of Agricultural Statistics were published during the year. A bulletin on agricultural improvements was issued as an elementary practical manual for agricultural associates and cultivators generally. A pamphlet on the cultivation of jute has been written by Mr. Finlow and published since the close of the year. A note on the sericultural experiments at Shillong, drawn up by Rai B. C. Basu Bahadur, Assistant Director of Agriculture, was contributed to the Agricultural Journal of India and printed copies thereof were distributed throughout the province. A report on the Sugarcane Industry of Eastern Bengal and Assam, also prepared by the Assistant Director for submission to the third annual meeting of the Board of Agriculture was circulated among District Officers.

Copies of a leaflet on the cultivation of jute in rotation with paddy, published by the Bengal Agricultural Department, were obtained and distributed to certain officers and private persons in this province.

Agricultural exhibitions.

57. In addition to the flower show at Shillong, agricultural shows were held during the year at Bogra, Malda, Faridpur, and Jalpaiguri to which contributions of Rs. 200, 150, 200 and 500, respectively, were made by this Department. At the Faridpur Exhibition specimens of tobacco and of cigars and cigarettes from the Rangpur Government Farm were shown. The Alipur and Falakata fairs in Jalpaiguri are kept up mainly for political reasons with a view to encourage trade between Bhutan and the plains and have not much connection with agriculture. The Agricultural and Industrial Exhibition at Bogra was a much more elaborate project and great credit is due to Mr. J. N. Gupta, I.C.S., Collector of the district, for the manner in which he organised it. The agricultural and industrial products exhibited were generally of very good quality. Special mention should be made of some samples of fine paddy, jute, cotton, silk, and potatoes. The working of five different kinds of hand-looms was demonstrated, and the local weavers took great interest in them. A small cattle show was also held in connection with the exhibition. Some good specimens of cows, both local and Behari, were exhibited. The exhibition was opened by me; the Assistant Director also attended and addressed a large

assembly on the subject of agricultural improvements. The exhibition was well attended and was a distinct success.

At the Malda Exhibition the working of some fly-shuttel looms, a Sayajee Cottage loom and a Japanese loom attracted special notice. The report received does not mention any strictly agricultural exhibits.

The Shillong Flower Show.

58. The fourth annual show held in Shillong on the 27th May last, attracted a much larger number both of visitors and of exhibits than any previous one. The exhibits included vegetables, orchids and other flowers, rare plants, fruits, dairy produce, honey, poultry, cattle, etc. The number registered was 1,474, but there were many others which could not be registered owing to their late arrival and to want of space. The entries of vegetables were particularly numerous. Eighty-four money prizes aggregating Rs. 355 were awarded in addition to a gold medal given by His Honour the Lieutenant-Governor for the best pair of cattle bred in the Khasi Hills.

Calcutta Industrial Exhibition.

59. Rai B. C. Basu Bahadur, Assistant Director of Agriculture, was placed on special duty from 26th October to 31st December 1906 in connection with the Calcutta Exhibition. In spite of the short time at his disposal he succeeded in making a large and interesting collection of agricultural and industrial products, which were displayed in a special court in the exhibition and attracted considerable interest. Among the industrial exhibits the fine *dhutis* and *saris* from Dacca and Pabna, specimens of the famous Dacca muslin, the well-known *eri* and *muga* cloth from the Assam Valley and Manipur, the *kashida* cloth, specimens of embroidery on velvet and netting cloth from Dacca, metal utensils from Tangail, papier-mache work from Bogra, bamboo and cane work, from Dacca and Sylhet jails, ivory carving from Manipur and other places, lemon grass oil from the Government Tropical plantation at Wahjain, soap prepared by the Bulbul Factory of Dacca were specially noteworthy. In the agricultural section various kinds of fine rice and cotton from Assam, tobacco from Rangpur, coffee, oranges, black pepper, cinnamon from the Khasi Hills, jute and various other products were exhibited. Other contributions included samples of timber from the Assam forests, of the famous Sylhet lime, of petroleum, coal and coke and other minerals. Mr. Basu was assisted in his work by Deputy Collector Babu S. M. Basu who relieved him of his charge on the 1st January. All the expenses connected with the collection of exhibits from this province and sending them to Calcutta were borne by Government. The total cost amounted approximately to Rs. 11,690.

Agricultural Associations.

60. There are in this province two Divisional Agricultural Associations, *viz.*, Chittagong and Rajshahi, and three District Associations, *viz.*, Rangpur, Malda, and Bogra. The Rajshahi Divisional Association is reported to have done practically nothing since its constitution. A few members of the Chittagong Divisional Association have achieved some more or less useful work, but no meetings appear to have been held. Malda District Association has now ceased to exist. In Bogra the members of the Association have done some useful work, but no meeting has been held since July 1905. The Rangpur Association held three meetings during 1906, and the Secretary, Babu Ashutosh Lahiri, Agricultural Associate, has done useful work.

On the whole it would seem that at present better results may be expected to be achieved by the individual work of the associates of the Department than by Agricultural Associations. There is no wish to discourage the latter, but it is felt that they will be more appropriate when a body of men has been organised in each district who are each working in communication with the Department for the advancement of agriculture.

Statistical work not purely agricultural.

61. Besides agricultural statistics of all kinds, the preparation of trade statistics and rainfall statistics also remained in charge of the Department during the year. I have submitted proposals for the transfer of trade statistical work from my office. These proposals are still under the consideration of Government. Among other matters not strictly agricultural, the subject of weaving has engaged a large share of the attention of the Department.

Cost of miscellaneous experiments and enquiries.

62. The details of the expenditure incurred by this Department on account of miscellaneous enquiries and experiments, other than those made in agricultural stations, will be found in Appendix III.

Concluding remarks.

63. The year has been mainly one of organization and preparation. It is believed that useful work has been done in encouraging and assisting the introduction of new crops and of more profitable methods of cultivation. But it is hoped that when the Department is fully equipped, it will, with the aid of the spirit of the agricultural improvement which now prevails, be able to greatly develop its useful activities to the benefit of both the agricultural and the commercial communities of the province.

My acknowledgments for good work are due to all the Superintendents in charge of agricultural stations. But above all, I desire to express my appreciation of the loyal assistance rendered by Rai Bhupal Chandra Basu Bahadur, Assistant Director, who combines a scientific and practical turn of mind with a wide knowledge of the agricultural conditions and capabilities of the province.

S. G. HART,

Director of Agriculture,
Eastern Bengal and Assam.

SHILLONG ;
The 28th October 1907.

APPENDIX I.

List of Agricultural Associates.

1. Mr. S. M. Bose, Gopalganj, Faridpur.
2. Babu Iswar Chandra Nandi, Fatheabad, Chittagong.
3. Babu Akshay Kumar Ghosh, Sibsagar.
4. Srijut Debeswar Gossain, Barpathar Sugarcane Farm, Golaghat.
5. Babu Man Gobind De Choudhuri, Silchar.
6. Babu Basanta Kumar Nandi, Itakhola, Sylhet.
7. Babu Ashutosh Lahiri, District Engineer, Rangpur.
8. Babu Rajani Kanta Bhattacharjya, Pleader, Rangpur.

APPENDIX II.

An account of the work done by the Fibre Expert.

Although my appointment dates from April 1905, the year 1906-1907 may be said to have been the commencing one as far as practical field work is concerned; a rather detailed statement is therefore advisable. I was engaged from June to October 1905 with indigo work and practically, from October 1905 until April 1906 I was occupied in touring in Bombay, Madras and the Central Provinces to investigate the possibility of the extension of jute cultivation to these tracts. An account of this tour, together with the conclusions arrived at, is contained in Bulletin No. 3 of July 1906. During the three months April, May and June 1906, I officiated as Imperial Agricultural Chemist at Pusa; but a number of plots of jute were sown under my supervision early in March and I was thus enabled to commence a comparative study of a large number of different races of jute, about 40. The basis of this comparison is the conclusions arrived at by the Committee appointed by the Board of Scientific Advice to investigate the question of alleged jute deterioration. In its report, issued in 1904, the Committee states that there are, in many districts, more or less distinctly recognized kinds of both species, Capsularis and Olitorius, respectively, of the genus Corchorus. These kinds are not "varieties" in the botanical sense, but "races"—they differ (*a*) in the length of time between the sowing and flowering stages, and also in the length of time between flowering and readiness for reaping; (*b*) in the habitual size of the plant, vigour of growth and in the degree to which branching occurs; (*c*) in the colour of stem, leaf, stalk, etc.

We thus see that two races of Corchorus Capsularis, grown for instances, in Rangpur and Faridpur, respectively, are never found to differ in a true botanical sense; distinctions, if any, are limited to colour of stem, time of ripening, quality of fibre, etc. These "cultural" differences are, at least possibly, due to environment and the author in collaboration with Mr. Burkill, Reporter on Economic Products to the Government of India, is engaged in investigating them. Such knowledge has a double importance. It is obviously necessary as a basis for pecper selection of the best kind of plant to be grown for fibre, but it is also of considerable interest from the practical point of view. The fact there are early and late races of jute might be taken advantage of by people growing large areas of it. One of the chief difficulties in such an undertaking, *viz.*, the cutting and retting of a very large weight of plant in a short time, would thus be considerably lessened. Further, the results of expert valuations of fibre produced from the races of jute grown in the variety experiment at Burdwan indicate that no one race is greatly superior to any other race as regards actual quality of fibre, though it may, on account of its greater size, yield a heavier crop under normal conditions, and thus be more profitable to grow—another characteristic possibly due to environment. Yet we know that, in the trade, certain "marks" always bring a higher price than others and an examination of samples shows that, while one is always fine and silky in texture, another is a much coarser and rougher fibre. To attempt to discover the cause of these differences and to decide, if possible, whether they are the result of environment, *viz.*, variations of climate or soil, or whether they are due to something intrinsic in the plant is one of the objects of the present investigations. During August and September 1906, the author accompanied Mr. Burkill on a long tour in Northern Bengal, the Western end of Assam Valley and Orissa: particular artention was paid to the characteristics of the jute grown in the different districts. Since then, we have examined a large number of specimens of typical plants from different districts and have gone through a mass of information regarding them. Our investigation seems to indicate that many of the races grown in different districts are, to all intents and purposes, identical and in a report which we are about to issue we hope to introduce a a tentative classification showing which of the races we consider identical. Such a classification can only, of course, be very imperfect at first; but we hope that members of the trade, especially those who live in the mofussil and are familiar with the different races of jute will help us to make it more complete. We shall then have made a considerable advance towards our object of improving the quality of jute fibre.

Selection Experiments at Pusa.

The plots at Pusa last year (1906) were used to commence a series of selection experiments, the object of course being to obtain an improved race by taking the seed of the best plants only in each plot. So far the only criteria for selection have been (*a*) length of stem, (*b*) straightness of stem, (*c*) freedom from branching. Later it is hoped that other points may be taken into account, such as fineness of fibre, strength, etc; what is wanted for this is a simple relation between the strength and other properties of the fibre which will enable a plant to be tested without cutting it down and retting the stem; this has to be done in the laboratory, and it may take some time to achieve the

object. In the meantime a plant to plant selection for the qualities first mentioned should undoubtedly give us much improved crops in the course of a few years. In this connection an interesting point may be mentioned. Last year, Corchorus Olitorius was practically a dead failure as a crop in Behar not only at Pusa but in other parts of the district. The same ill-success attended efforts to grow it in Madras in places where Corchorus Capsularis does very well. This year (1907) similar cases have come to my knowledge both from Behar and from Assam where crops of Corchorus Olitorius after germinating well, commenced to branch and to flower when about 6 inches high. At Pusa, in 1906, the great majority of the plants in two plots of Tosha of Serajganj, and Satnalla of Faridpur, respectively, showed this characteristic of premature branching and flowering. A few plants, however, were normal and seed was carefully gathered from these and sown this year. The result is quite a good crop in which only one or two plants have shown the habit which was characteristic of the majority last year. It thus appears that the range of suitable conditions for Corchorus Olitorius is much narrower than for Corchorus Capsularis; in other words, the former has hitherto been grown on a much more restricted area than the latter. The results just described show, however, that it is possible to breed a much hardier race.

Assam.—The author has spent a considerable proportion of the months of March, April and May of the present year on a tour to investigate the possibilities of the country for jute cultivation. Briefly, it may be said that while practically the whole of this part of India is suitable, some districts are capable of bearing enormous crops of fibre of exceedingly fine quality. I have myself seen numbers of samples of such fibre.

While the cultivation of jute will and is—as this year's forecast shows—extending rapidly in the western end of the Assam Valley and in other places where the population is thick; yet there are other districts, equally capable of bearing good crops of jute which are to a large extent unpopulated; and it is a question whether immediate steps should not be taken by Government to induce cultivators to emigrate form over-crowded districts in Bengal to these rich lands of Assam. Many of the large Calcutta business houses who are interested in both jute and tea are already experimenting on their tea estates with jute as a minor crop; and two or three European syndicates are growing jute on a large scale in the valley. These ventures are well worth attention as indicating the possibilities of jute as a crop for European development It has certainly taken a firm hold in Behar among Indigo Planters, and there seems no *a priori* reason why the same should not be the case in Assam.

Jute Experiments in other Provinces.

Madras.—Experiments with jute have now been carried on at the Samalkot Experimental station for three years. In 1905-1906 the results were far from satisfactory but in 1906-1907 a yield of 10 maunds of fibre per acre, valued in Calcutta at Rs. 10-8 per maund was obtained. Mr. Barber, the Government Botanist, who conducted the experiments says:—The results are so encouraging that further experiments of a definite character are justifiable. The results of this year's trials promise to be very encouraging, especially as the best jute is that which has been sown early. The cultivator will thus be able to take a crop of rice off the land after the jute. About three maunds of jute seed supplied by me has been distributed this year to the cultivators in the Godavari Delta. Trials with jute are also being conducted in the Cauveri Delta and in South Malabar.

Bimlipatam jute (Hibiscus cannabinus) is of course already widely grown, especially in Vizagapatam and in parts of the Guntur and Kistna districts. Its cultivation, however, is practically confined to these three districts, whereas jute would be grown chiefly, if not only, in the great deltas and in South Malabara.

Bombay.—Jute trials were carried out for the first time, at several places in the Bombay Presidency last year (1906); but the only one which gave clear indications of success was that conducted at the Ganeshkind Gardens, Poona, by Professor Gammie. In this case a yield of 7½ maunds per acre was obtained, which was valued in Calcutta at Rs. 10-4 per maund. The result was considered encouraging enough to warrant further and more extensive trials during the present year, as it is thought that jute may prove to be a useful and paying rotation crop with sugarcane in the Presidency.

Central Provinces.—Jute trials at Raipur and Nagpur last year were not successful. The climatic conditions render it impossible, without irrigation, to sow jute before the commencement of the monsoon; so that the time given for growth is short. The germination of the crop was very good; but the Bengalee cultivator from Dacca who had been imported by the Central Provinces Agricultural Department did not attend to either weeding or thinning. The results, therefore, were worse than they should have been.

This year (1907) further trials have been made at Raipur and Nagpur; at both places, however, sowing was carried out much earlier in April with irrigation; and the results, the Deputy Director of Agriculture says, promise very well. It is indeed fairly certain that, if there is sufficient water for irrigation at sowing time, a large area of land in Chattisgarh might be opened up to jute cultivation.

The Punjab.—During the present year, the Punjab Agricultural Department are conducting trials with jute at Lyallpur in the Chenab Irrigation Colony. Seed has been sown at intervals from about the middle of April and, although, owing to the tendency of the land to cake in the sun, the proper germination of the crop has been found to be a difficulty, Mr. Dobbs, the Principal of the Lyallpur Agricultural College, thinks it will be got over and is sanguine as to the success of the experiments. The plants in the earliest plot were 9 feet high in the middle of July.

Wet jute.

The work on this subject was discontinued when Government decided not to legislate in the matter. It will be taken up again when opportunity offers on account of its interest from a scientific as well as from a practical point of view. Briefly, the results so far obtained seem to indicate that a normal sample of jute in a saturated atmosphere at a high temperature may contain up to 23 per cent. of moisture, calculated on the weight of *moist* sample. This figure agrees with results quoted by Messrs. Cross and Bevan and with the standard used in continental conditioning houses. But the results also

indicated that at lower temperatures or with drier atmosphere the normal moisture content of jute fibre is much less than the above mentioned percentage. Probably an average figure for the rainy season might be rather under 15 per cent., while for the cold weather and the succeeding dry weather 10 per cent. of moisture would be nearer the mark.

Other fibres than jute.

Flax.—Seeds of various kinds of exotic flax were sown at Pusa last cold weather, 1906-1907, and were reaped during March 1907. It is perhaps too early to say yet whether seed from Russia or Holland or Australia does best for India; but it is safe to say that these trials seem to support those made at various other places in Behar, notably at Dooriah, by Sir Louis Hay, Bart, and Mr. Cameron—which indicate that flax straw of good quality can be grown in India. Owing to the later arrival of breaking and scutching machinery from Europe, it has not been possible so far to extract the fibre, although some of the straw has been retted. A good deal has been learned about the crop from Mr. Vander Kerkover, the Belgian Flax Expert, engaged by the Government of Bengal.

It is hardly to be expected that the wetter parts of Eastern Bengal and Assam would prove suitable for Flax cultivation, on account of the fact that there is practically no hot dry weather, which is necessary both for ripening the straw and for drying the same after the retting process has been finished. Districts like Rajshahi, however, ought to prove very suitable in this respect.

Other Fibres.—Experimental cultivation is being made at Pusa this year of a number of fibre plants collected from different parts of India. Sida may be mentioned as one and the others include several varieties of Hibiscus. The object is to investigate as far as possible the fibre-producing plants of the country and to develope them if the experiments prove it to be worth while.

Sida is undoubtedly a fibre of very high class; it is far superior to jute; indeed, it probably ranks nearer to Flax and Rhea. It is a common plant all over India, but it grows especially well in the moist climate of Assam. I have sown plots at Rajshahi this year which are doing well.

ROBERT S. FINLOW.

PUSA;

The 25th July 1907.

APPENDIX III.

Expenditure on Miscellaneous experiments and enquiries made by the Department during the year ending the 30th June 1907.

	Rs.	a.	p.
(1) Cost of seeds and manures distributed	592	13	3
(2) Jute demonstration	856	11	1
(3) Wheat experiments	44	14	0
(4) Rhubarb demonstration	236	10	6
(5) Demonstration of fly-shuttle loom	383	12	0
(6) Contribution to Agricultural and Horticultural Exibitions	2,064	11	0
(7) Miscellaneous, including scholarships, etc., to Poona and Chinsura students ...	1,123	1	7
Total	5,302	9	5

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Resolution on the Report of the Agricultural Department, Eastern Bengal and Assam. 1906-1907.

Extract from the Proceedings of the Lieutenant-Governor of Eastern Bengal and Assam in the Revenue Department, No. 452E., *dated Shillong, the 28th February* 1908.

READ—

Letter No. 7935G., dated the 20th October 1907, from the Director of Agriculture, Eastern Bengal and Assam, submitting his annual report on the Agricultural Department of this Province forthe year ending the 30th June 1907.

RESOLUTION.

DURING the year under report the Department of Agriculture was separated from that of Land Records in this Province, and Mr S. G. Hart, I.C.S., was appointed as its Director. The organisation of the Department has made material progress, and some of the expert officers who are required for the assistance of the Director are being recruited. The sanction of the Government of India has also been received to the proposals formulated by Sir Bampfylde Fuller for the working of the Department, a copy of which was appended to last year's Resolution. The work of the Veterinary Department has been reviewed in a separate Resolution of this Government, No. 10204C., dated the 9th September 1907.

2. During the past year the principal staple crops which were under investigation were jute, cotton and wheat.

The experiments in jute cultivation have been in the main satisfactory, and the interesting note of the fibre expert, Mr. R. S. Finlow, who joined the department in July 1906, shows that the area for jute cultivation is capable of almost indefinite expansion throughout Assam, and that in the Assam Valley at least the results to be obtained from this crop should be almost if not quite as good as those obtained in the Eastern Bengal districts of the Province. Commercial firms in Calcutta already appreciate this fact, and are conducting experiments with a view to a large extension of the cultivation of this valuable crop, and Government is meanwhile assisting the Assam-Bengal Railway in experimenting with jute in the railway lands adjacent to the main line. The varying measure of success which has attended the experiments in these lands is due to the extreme diversity of soils and climatic conditions obtaining in the areas through which the line passes. Mr. Finlow has in addition to his enquiries in Eastern Bengal and Assam assisted in experiments in jute cultivation made by the Agricultural Departments of other Provinces, and the Lieutenant-Governor has much pleasure in recording his appreciation of the work thus done by him.

Experiments with various kinds of cotton have been tried in all the divisions of the Province, and the result has been almost universally a failure.

The experiments with wheat which were initiated recently in the neighbourhood of Lumding have proved unsuccessful. Further trials of this form of cultivation will, however, be made in the drier tracts bordering on the Nambor Forest.

The land for the Government Central Farm at Dacca has also been acquired and fenced, and the buildings are in process of erection.

3. In the Resolution recorded on the Agricultural Report for 1905-1906 the Lieutenant-Governor instructed the Director of Agriculture to devote his special attention to the weaving industry and to assist weavers by demonstrating the use of modern appliances and by practical help, where such should be solicited. The Director has, accordingly, included demonstrations with the fly-shuttle loom in the various agricultural exhibitions which have been held throughout the Province, but although these experiments have attracted much interest there are only isolated cases recorded at present in which the people have made any practical use of the knowledge obtained therefrom. This was, however, to be expected, as the conservatism of the weavers as a class is well known and is naturally difficult to overcome. Sir Lancelot Hare hopes that these demonstrations will be persevered in for several years in succession, as the limited experience of the present year should not be held to be discouraging or deter the officers of the department from further efforts to assist in the revival of this indigenous industry.

4. The experiments in fruit-farming and market-gardening continued to meet with great success in the Khasi and Jaintia Hills, and it is noted with pleasure that new crops are being tried continually and that the hill people show a very practical interest in the improvement of their market produce. In the plains the experiments in market gardening have not as yet met with any great success. As the Director observes, the cultivators are able to utilise the land at their disposal to better purpose in growing rice, jute and other staples, especially since the price of rice has risen so considerably. It is clearly useless to attempt the introduction of any new crops which cannot be demonstrated to be at least as profitable as those already grown, and the Agricultural Department will doubtless investigate this, the economic, side of the question in all cases before such experiments are instituted.

5. Some of the experiments which have been made with sugarcane have shown a marked measure of success. At Rangpur and Rajshahi this crop has been treated in a scientific manner with excellent results, and the neighbouring cultivators are learning to appreciate the value of the demonstrations witnessed by them. In this connection the Lieutenant-Governor would endorse the Director's remarks as to the simplification of agricultural experiments in Government and Wards' Estates, and the suggestion that they should be mainly confined to the cultivation of crops with which the people are familiar. The practical effect of the sight of an excellent crop of sugarcane is far greater than the sight of an indifferent market garden.

6. Schemes for the improvement of the sericultural industry are still in process of evolution, much difficulty having been found in obtaining skilled assistance in this branch of agricultural work. The Sericultural School at Rampur-Boalia, which was reorganised during the year, has made a successful start as a separate Institution.

7. At the industrial exhibition at Calcutta specimens of the agricultural and industrial products of all parts of the province were displayed, and the quality and completeness of the provincial exhibits, which received marked appreciation from all visitors, reflect great credit upon the Assistant Director, Rai Bahadur Bhupal Chandra Basu, and the District Officers and others who assisted him. Of the local exhibitions, those at Bogra and Shillong were the most successful. The exhibition at Bogra owed its success largely to the energies of the Collector, Mr. G. N. Gupta, and some substantial and practical results are said to have followed on the Government weaving demonstrations there.

8. Interesting and successful experiments in inter-breeding between Patna and Khasi cattle have been made during the year, and the results are highly appreciated. The inferiority of the breeds of cattle in the plains portion of the province is at present a great hindrance to the work of the Department. The Lieutenant-Governor has invited the attention of the Director of Agriculture to the great commercial possibilities of the poultry industry in the districts of the Chittagong Division, and has ordered that special enquiries be made on this subject during the ensuing year.

9. Three scholars have been sent from this province to Poona during the year to undergo a preliminary training before proceeding to the Pusa Institute, and shortly before the close of the year it was arranged between the Government of Bengal and this Government that one-third of the recurring cost of the new Bhagalpur Agricultural College, to which students of this province will be admitted, shall be borne by Eastern Bengal and Assam for the next eight years or until the Agricultural College for this province has been established.

10. The Lieutenant-Governor notes with special satisfaction the progress that has been made in enlisting the assistance of non-official gentlemen in works of agricultural improvement, and he agrees with the Director that the Agricultural Associates and Honorary Correspondents who have been appointed will be voluntary public servants of no mean value to the community. By their example they will assist in the material advancement of their neighbours, and they will enable the Agricultural Department to keep in touch with the real wants of the cultivators in each tract and to disseminate such agricultural information as may be of special use to the people.

11. The thanks of Government are due to Mr. Hart for the work done by him during the year in organising the Department and for his interesting Report, and his appreciation of the loyal and efficient services of Rai Bhupal Chandra Basu Bahadur is cordially endorsed by the Lieutenant-Governor.

ORDERED that a copy of the Resolution be published in the *Government Gazette* for general information.

By order of the Lieutenant-Governor,

P. C. LYON,

Chief Secretary to the Government of Eastern Bengal and Assam.

E. B. & A. S. P. O. (C. S. D.) No. 1118—550—3-3-1908.

REPORT

OF THE

AGRICULTURAL DEPARTMENT, EASTERN BENGAL AND ASSAM,

FOR THE YEAR

1907-1908.

BY

S. G. HART., Esq., I.C.S.,

DIRECTOR OF AGRICULTURE, EASTERN BENGAL AND ASSAM.

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No. 1 G.

FROM

S. G. HART, ESQ., I.C.S.,

DIRECTOR OF AGRICULTURE,

EASTERN BENGAL AND ASSAM.

To

THE CHIEF SECRETARY TO THE GOVERNMENT OF

EASTERN BENGAL AND ASSAM.

Shillong, the 1st January 1909.

SIR,

I HAVE the honour to submit the following report on the operations of the Department of Agriculture during the year ending the 30th June 1908.

I have the honour to be,

SIR,

Your most obedient Servant,

S. G. HART,

Director of Agriculture, Eastern Bengal and Assam.

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REPORT

OF THE

DEPARTMENT OF AGRICULTURE, EASTERN BENGAL AND ASSAM,

FOR THE YEAR ENDING

30TH JUNE 1908.

CHAPTER I.

GENERAL ADMINISTRATION.

Members of the superior staff.

1. The Department was in my charge throughout the year. Rai B. C. Basu Bahadur acted as Assistant Director, except for five weeks in 1907, when he took short leave. Mr. R. S. Finlow, B.SC., continued to fill the post of Fibre Expert. Mr. A. A. Meggitt, B.SC., joined the Department on the 9th December 1907 as Agricultural Chemist. Mr. G. P. Hector, who has been selected as the Economic Botanist of this province, is still under training at Pusa, but it is expected that he will take up his duties in Eastern Bengal and Assam by February next. Mr. A. G. Birt, Supernumerary Agriculturist, joined the Department on the 12th June 1908, and has since the close of the year relieved Rai B. C. Basu Bahadur, who is absent on furlough. Mr. Jatindra Nath Chakrabarti, a graduate of Sibpur College, Bengal, and of Cornell University, United States of America, was appointed Agricultural Supervisor on the 4th January 1908; but in the following June he was, on the advice of the Inspector General of Agriculture, deputed to Pusa for nine months' special training in the practical work of an agricultural station. Babu Hiranya Kumar Das Gupta, Sub-Deputy Collector, continued during the year to be on special duty at the headquarters office, where he acted practically as my Personal Assistant.

Babus Jamini Kumar Biswas, Rajeswar Das Gupta and Har Kumar Guha were in charge as Superintendents of the Rangpur, Jorhat and Rajshahi Farms. U Herrick Singh was Superintendent of the three Khasi Hills Experimental stations. Babu Kali Das Rai, Supernumerary Farm Superintendent, was, owing to the want of an Agricultural Supervisor, in sole charge of the Dacca station. Mr. M. M. Chakrabarti, who has passed a course in Sericulture at Tokio University, was selected for training under Mr. A. K. Ghose of Bengal, and from the 1st May 1908 was in subordinate charge of sericultural operations in this province. Since the close of the year sanction to the opening of a seed depôt has been received, and Babu Rajeswar Das Gupta has been appointed Superintendent with headquarters on the Dacca Farm.

Director.

2. I was on tour for 193 days during the year. The places where I spent most time were Dacca and Rajshahi. At Dacca there was a great deal of work in connection with the opening out of the farm and the construction of the central laboratory and Experts' residences. The acquisition of a site for the veterinary headquarters of the province was also arranged. At Rajshahi there was also much to do in connection with the farm, but most of my time there was occupied in arranging for the institution of sericultural work on a large scale. On several occasions I met there Mr. Ghose, Superintendent of Sericulture in Bengal, Mr. Chakrabarti, Superintendent-designate in this province, Messrs. Fraser, Stack, Weston and various Indian gentlemen interested in sericulture, with whom I had many useful discussions regarding the most advantageous lines on which to work this new branch of the Department. At every place visited I make a point of meeting the local gentlemen who take an active interest in any branch of agriculture, and many such have now become regular correspondents of the Department. I visited all the agricultural stations, and also endeavoured to make myself familiar, as far as possible, with the conditions of cultivation in the various parts of the province. Several places in Noakhali and Chittagong districts were visited in connection with the development of a scheme for the improvement of local breeds of poultry. Supervision of veterinary work has received attention. Most of our Veterinary Assistants are young men, newly come from college, to whom it is a great advantage and stimulus to receive in their early days some special direction and encouragement in carrying out their new duties. Much time has also been spent in discussing the agricultural statistics of various districts with the officers who are mainly responsible for their compilation, and in this way many mistakes have come to light and much new information has been gathered. In company with the Superintendent, Veterinary Department, I attended the first Veterinary Conference at Calcutta on the 10th February 1908 and following days. The fourth annual meeting of the Board of Agriculture in India was held at Pusa from the 17th to 22nd February. Rai Bahadur B. C. Basu, Assistant

Director of Agriculture, Mr. A. A. Meggitt, Agricultural Chemist, and Mr. R. S. Finlow, Fibre Expert, and I attended the Conference as members from Eastern Bengal and Assam. On my return from Pusa, under orders of the Local Government, I halted at Calcutta to discuss with Mr. C. W. E. Cotton, Officiating Director General of Commercial Intelligence, the various pending questions regarding the registration of trade in Eastern Bengal and Assam.

Assistant Director.

3. Mr. Basu was on tour for 192 days. The supervision of the seven agricultural stations is more than sufficient to occupy the whole time of one officer, but, in addition, Mr. Basu took great interest in inspecting and advising on the various demonstrations and experiments which are being made by private persons with the support of this Department. He also made numerous enquiries connected with agricultural subjects and published bulletins on potato cultivation, insect pests, coffee cultivation, the use of Bordeaux mixture as a preventive of potato disease, *jhum* cultivation, and a most useful pamphlet on some agricultural improvement recommended for general adoption. Mr. Basu, also rendered great assistance to the organisers of the Jorhat Exhibition. His miscellaneous inquiries included such subjects as the available supply of decayed fish for manure, hand-loom weaving and the canning of fruit, in the last of which he made some practical experiments. In all branches of the work of this Department Mr. Basu's experience and capacity were of great assistance to me, and I am very much indebted to him for his unvarying zeal and loyalty. At the close of the year, Mr. Basu accompanied Mr. Birt on a tour to all the agricultural stations of the province and explained the work in progress at each. Shortly afterwards Mr. Birt took over Mr. Basu's appointment on the latter taking furlough.

Fibre Expert.

4. Mr. Finlow's headquarters are still at Pusa, and must continue there till the Dacca laboratory building is ready. This is unfortunate for the province and a great handicap to Mr. Finlow, for it is impossible for him, living at Pusa, to take the same interest and to acquire the same familiarity with the conditions of Eastern Bengal and Assam as he would do if living at Dacca. In collaboration with Mr. Burkill, Reporter on Economic Products, Mr. Finlow has continued the investigation of the races of jute and has published a preliminary account of the results hitherto attained in Agricultural Ledger No. 6 of 1907. In co-operation with Messrs. Cross and Bevan of London, Mr. Finlow has made an investigation regarding the causes and prevention of "heart-damage" in jute. The question of the manner in which this investigation should be continued is now under the consideration of the Government of India and the Secretary of State. In 1908, Mr. Finlow organised some demonstrations of jute cultivation in Chittagong with a view to extending the area of the crop in that district. Statistics regarding the results of the demonstrations are not yet available. Experiments were made during the year with flax, sida, and other fibres; but, for various reasons, none of them have yielded satisfactory results which can be quoted. Mr. Finlow has under preparation a monograph on jute cultivation in Eastern Bengal and Assam, and pamphlets on the cultivation of flax and on the indigenous fibre plants of this province. Mr. Finlow's own account of his year's work is printed as an appendix to this report.

Agricultural Chemist.

5. Mr. Meggitt is under the very serious disadvantage of having no laboratory. After joining the Department he was occupied till the middle of March in making analyses of the sugarcane crop on Jorhat Farm. In May and June he visited Sibsagar and Sylhet in connection with an enquiry called for by Government regarding the fertilising value of silt. In the intervals of other work he has planned the fitting, lightings, etc., of the Dacca laboratory, and I am greatly indebted to him for his assistance in this connection.

Agricultural Supervisor.

6. On joining his appointment, Mr. J. N. Chakrabarti spent the whole of February in assisting the organisation of the Jorhat Exhibition. He was then deputed to make an enquiry regarding the methods of tobacco cultivation followed in Rangpur and Jalpaiguri. His report has been of great use in planning the future lines of work at the Burirhat (Rangpur) tobacco station. At the request of the Cooch Behar State, Mr. Chakrabarti was also permitted to inspect the tobacco experiments being carried out there.

Farm Superintendents.

7. All the Farm Superintendents have worked well. Special mention should be made of Mr. Herrick Singh who shows much tact in training his assistants and apprentices and in spreading among the neighbouring cultivators the use of the new methods which have been proved on our farms to be advantageous.

Entomologist and Mycologist.

8. A Khasia youth who had been trained at Pusa was appointed Entomological Collector with headquarters at Dacca. Besides the investigation of insect pests in the neighbourhood of Dacca, he was sent out to other districts where insects were damaging the crops. Unfortunately, he did not take kindly to life in the plains, and soon lost all active interest in his own special work, and, after less than a year's service, resigned. He will be succeeded by a resident of Eastern Bengal who was nominated by, and is now under the training of, the Imperial Entomologist. The appointment of a Mycological Collector on Rs. 30—50 has also been sanctioned by Government, and a young Bengali-Assamese who has been selected for the post is now being trained at Pusa under Dr. Butler. Though collectors are useful, there can be no doubt that an entomologist and a mycologist of much higher standing and trining are really necessary for this province, in which there is anenormous scope for their abilities.

Honorary Assistants.

9. The Department is gradually attracting to itself a body of practical and enthusiastic Honorary Assistants. These are gentlemen who hold progressive ideas as to the development of agriculture, and who are sufficiently public spirited to act in an honorary capacity. A list of the Honorary Correspondents who had been appointed up to the 30th June 1908 is given in Appendix. On many occasions during the year I have found that the information regarding the condition and prospect of crops received from these gentlemen was more accurate than that received officially. Reports of outbreaks of insect and fungus pests are of little value unless received promptly, and in this respect also Honorary Correspondents have rendered very great service to the Department and to the cultivators in their neighbourhood. It is easy to see that in time the Honorary Correspondents will become absolutely invaluable intermediaries for bringing to the notice of the Department the needs of the cultivators and for making known to the latter the improvements in agricultural practice discovered and tested by the officers of the Department. Some of the correspondents who have the time and the practical experience to be able to make every year a field demonstration of some improvement recommended by the Department are enrolled as agricultural associates. In the list given in Appendix II the names of associates are distinguished by an asterisk. The number of these gentlemen could be easily increased but for the fact that the Department does not at present possess enough superior expert agriculturists to be able to undertake more than the most strictly limited amount of work outside the agricultural stations. Since, however, no real good is effected until our work gets outside the boundaries of our farms and penetrates to the rayats the recruitment of a large number of fieldmen demonstrators and of an adequate superior staff to organise and direct their work and that of the agricultural associates is a most pressing necessity. The Local Government is very desirous that this work should be developed as rapidly as possible, and is very generous in allotting funds for the purpose. The only obstacle is the fact that at present young men cannot be found who possess the necessary scientific and technical training to make them fit for the superior posts in the Department.

When we have a large number of associates at work the proper time will have come for them to band themselves together in associations for discussion of the work already done and to arrange for future development and co-operation. The fact that agricultural associations established to order are unlikely to take root in this province is evident from the fact that only two divisional and two district associations still remain in existence. During 1907-1908 neither of the divisional associations held a meeting. The Bogra District Association held two meetings, at one of which I was present, at which there was some useful discussion of agricultural subjects. The Rangpur Association held three meetings, and since the close of the year has shown evidence of vigorous life by the energy with which the members are developing the Rangpur Farm which the Government has now handed over to them together with an annual grant of Rs. 3,000, which is supplemented by subsidies from the District Board. The Collector, Mr. Vas, is Chairman of the Association and takes a great interest in its work. Babu Ashutosh Lahiri, one of the most capable of our agricultural associates, is the life and soul of the Association. In the Karimganj subdivision of South Sylhet there has been a spontaneous growth of a special committee of the Local Board to look after veterinary and agricultural matters, especially the breeding of cattle and measures against insects injurious to crops. The formation of this committee is due to the enthusiasm of two or three keen agriculturists on the Board, and its progress will be watched with great interest.

Buildings.

10. The headquarters of the agricultural experts of this province will be located on the Dacca farm. Until the laboratory building and the residences are completed, the experts will be unable

to make any substantial progress with their work. It is much to be regretted that, in spite of the continual pressure brought to bear, the Public Works Department has hitherto been able to make but little progress with these buildings. One residence was nearly completed, when in May last it was entirely swept away by a cyclone. About the same time the Government of India was pleased to sanction, on the application of the Local Government, an expenditure in excess of the usual scale on the residences at the farm. New plans were then drawn up for houses of a more substantial type, but there has been great delay in getting them passed. Some progress has, however, been made with the laboratory building, and it may be expected to be in complete working order before the end of 1909. Quarters for subordinate officers are being built by this Department and nearly sufficient accommodation has already been provided for the officers hitherto appointed.

Financial.

11. The receipts of the Department amounted to Rs. 7,036-2-5 during the year, and the expenditure to Rs. 1,90,386-13-0, exclusive of Rs. 28,868 spent by the Public Works Department on buildings, roads, etc. The principal heads of account are shown in Appendix III.

The charges incurred on account of miscellaneous enquiries and experiments amounted to Rs. 14,617-5-0, against Rs 5,302-9-5 in the previous year. The chief causes of this marked increase are increased issues of seeds, manures and implements, Mr. Finlow's investigation regarding the deterioration of damp baled jute, and a special grant of Rs. 2,000 towards the Jorhat Exhibition.

CHAPTER II.

AGRICULTURAL STATIONS.

Dacca.

12. The work done during the year consisted chiefly of reclamation of land under jungle, levelling and laying out of experimental areas. The *jowar* crops grown in 1908 have shown that the plots which have been made level on the surface are now very uneven in respect to soil, and some years of uniform cropping will be necessary before they can be considered fit for comparative experiment. Most of the farm roads have now been made, the cattle sheds, godowns and farm office are complete, residences for the Agricultural Supervisor in charge, two overseers and a fieldman clerk have been finished, and a house for the Supernumerary Farm Superintendent is almost ready. In spite of many attempts, suitable cattle could not be procured during the year. Most of the cultivable land was therefore leased out to neighbouring rayats. Some *rabi* crops were grown, but did not give satisfactory results, except to some extent in the case of potatoes. The farm had, however, such an inadequate staff that reclamation, levelling, road-making and building occupied them entirely, and there was little opportunity, even if the soil had been in a suitable condition, for properly-conducted agricultural experiments.

Rajshahi.

13. Rajshahi is the most advanced of our agricultural stations, though much still remains to be done in the provision of suitable buildings and fences and still more in the building up of experimental plots to a condition of uniform fertility. A very long cropping programme had been planned for the year 1907-1908, but a cessation of rain from the middle of July to the end of September made the transplanting of winter rice impossible, and considerably interfered with the success of several other crops. The best results were obtained with sugarcane and potatoes. For the second year Dacca *gandari* cane proved itself to be far more profitable, with the climate and soil of Rajshahi farm, to the variety most commonly grown in the neighbourhood. As a result of this success, a demand for cuttings has set in, and, should this demand increase, steps will be taken to meet it. Darjeeling potatoes were tried for the first time on the farms. Field conditions were observed, and the crop received practically no watering and no more manure than a rayat could generally afford to give. To reduce expenses, every tuber was cut into as many sets as possible. On these conditions a field of half an acre yielded over 107 maunds of potatoes and gave a net profit of Rs. 118. This field had been fallowed during the preceding rains, but the soil was kept open by frequent ploughing. The resulting crop was quite good when the lowness of the seed-rate, $7\frac{1}{4}$ maunds per acre, is considered. The lowness of initial expenses is an important point for rayats on whom the interest on borrowed money is a heavy charge.

Jorhat.

14. The work done at the Jorhat station confirmed the experience of the previous year that of the nine varieties of sugarcane under experiment, striped Mauritius is easily the best of the first-year plants. This variety headed the list in regard to weight of cane per acre, richness of juice and total sugar content. The *khari* variety came second as a "first year's" plant, but as ratoon cane was far superior to striped Mauritius and other varieties.

Too much reliance must not, however, be placed on these results, as the soil of the farm is known to be still of very uneven fertility, and the main object to be kept in view during the next five years is to arrange the cropping programme as to bring about as quickly as possible uniformity of soil conditions over large blocks of land.

Rangpur and Burirhat.

15. Rangpur having been found unsuitable as a tobacco station, a new station was opened during the year at Burirhat, some six miles distant. The land having only just been acquired was not in a condition for strict experimental work, nor was there suitable accommodation at Burirhat for the farm staff. To avoid losing a year's work, the previous cropping programme of the Rangpur station was repeated and as much time as possible was also given to the cultivation and equipment of the new station. On the 31st July 1908 the Department finally handed over the Rangpur farm to the local Agricultural Association, who will work it mainly as a demonstration station with the aid of grants from the Government and District Board. The most important incident during the year has been the receipt of valuations by English experts of the foreign tobaccos grown at Rangpur. It must be admitted that these were of a most discouraging character, but they would perhaps not have been so unfavourable but that for lack of proper storage accommodation the tobacco was mouldy by the time it reached England. Fresh samples of the 1908 crop which were produced and stored under better conditions have recently been sent to England, and the experts' opinions are awaited with considerable anxiety. We are, however, prepared for the eventuality that we may finally have to recognise that the climate and soil of Rangpur are unsuitable for the better varieties of foreign tobacco. There will still remain much valuable work to be done by experimenting with local varieties with a view to ascertaining how larger crops and higher profits may be realised. Some interesting experiments in ginger cultivation were also made during 1907-1908, but the results are not conclusive, owing partly to the outbreak of a fungus disease and partly to the wide differences between the valuations quoted by experts, to whom samples of the ginger were submitted.

Wahjain.

16. Of the tropical plants under trial at the Wahjain plantation, cocoa, camphor, cinnamon, pineapples, Natal oranges, sapota and mangoes are doing well. The only definite results obtained during the year were, however, with lemon-grass. Three distillations of oil from this grass were made, with the result that at an expenditure of Rs. 133 oil worth Rs. 281-12 was obtained. This result is so encouraging that several neighbouring cultivators have planted out roots of lemon-grass obtained from the plantation, and at least one is now distilling the oil for himself. The only obstacle to a rapid extension of this new industry is the difficulty of finding a reliable market for the oil. The assistance of the Director General of Commercial Intelligence has been invoked, and a satisfactory arrangement will probably soon be made.

Upper Shillong Station.

17. The principal crop dealt with at Upper Shillong was potatoes. The experiments in spraying with Bordeaux mixture were repeated not only on the farm but also on 7 demonstration plots selected in the fields of rayats in neighbouring villages. In all cases the spraying resulted in increased profit and, curiously enough, the gain was greater on the demonstration plots than on this farm. This has led to a demand among the Khasis for spraying machines, and efforts are being made to ascertain what is the most efficient machine at a cost within their means. In the variety tests the largest yields were given by "King of Potatoes" which has the further advantage of freedom from disease. Other varieties which gave good result include Nainital, Khasi round, Eldorado, King Edward VII and Farm Magnum Bonum. Several other experiments were made in the cultivation of potatoes, but though the results were generally successful they were obtained on plots too small to justify an assertion that similar methods would meet with equal success if applied to large fields. Arrangements are being made to repeat most of the experiments in 1909 on much larger plots.

The Upper Shillong Station is also a cattle-breeding farm. As excellent results have been obtained by crossing Patna with the local breed, it has been decided to confine our attention to the breeding of pure Patna cattle for distribution. There is a keen demand among Khasis for cattle from the farm, and it is intended in future only to dispose of Patna bulls to villages where the local Khasi bulls have been castrated. Most of the fodder required for the herd is produced on the farm and a large stock of ensilage is made for feeding during the winter.

Fruit Experiment Station, Shillong.

18. Most of the fruit trees are thriving, but they generally fail to set fruit, or most of it falls off before ripening. This is partly due to the high winds which prevail from February to April and the

heavy rainfall during the monsoon season. There are probably also other causes and the root-pruning of a large number of trees during the winter of 1907-1908 had a good effect. The subject of pruning requires, and is being given, more attention than it has received in the past. With some fruit, however, such as peaches and grapes, it seems unlikely that really good results will be attained unless varieties can be introduced which will ripen in May. The Shillong black grape, tree tomato and mountain papaya yield well, but unfortunately do not command a large market. The cultivation of strawberries, asparagus, rhubarb and sweet potatoes is very profitable and is being extended among the Khasis.

The experiments in rearing of silkworms are referred to in paragraph 33.

CHAPTER III.

PROGRESS IN INTRODUCING AGRICULTURAL IMPROVEMENTS.

19. New methods in agriculture, which have been proved to be more profitable than the old, are extended through the medium of (i) demonstrations and distribution of seed, (ii) publication of leaflets and bulletins, (iii) agricultural education, and (iv) exhibitions and shows. The present chapter is a brief account of the measures taken during 1907-1908 to extend improvements by distribution of seed and by demonstrations conducted by officers a d Honorary Assistants of the Agricultural Department, officers of other Departments and other gentlemen who take an active interest in agriculture. It is convenient to describe separately for each principal crop the improvements introduced in regard to variety, manurial treatment, and the treatment of the insect pests and fungus diseases to which the crop is subject.

Cotton.

20. Innumerable attempts have been made, especially since the spread of *swadeshi* ideas, to grow the finer varieties of cotton as field crops. On the plains every experiment, even with the coarsest varieties, has been a failure. But on the low hills, where the coarse short-stapled cottons of Assam grow well, there is reason to think that an improved variety, provided it is acclimatised and hardy, can be successfully introduced. To test this point, the Department has taken a loan of a small area on a private experimental farm (Baikantapur) on the low hills of South Sylhet. Five varieties of cotton were grown there in 1907. King's Improved, Caravonica, and Spence's were a complete failure. Dharwar and *Buri* gave fairly good crops. The exact amount is not known, because the records were destroyed in a fire which burnt down the farm-house last spring. The experiment is being repeated this year with the same varieties, excepting Caravonica, which has proved a uniform failure.

As *Buri* proved the most successful variety at Baikantapur, and as from what is otherwise known of that variety it seems likely to succeed in this province, 7 maunds of seed were obtained through the Director of Agriculture, Bengal, and distributed to cultivators in the Chittagong Hill Tracts, the Lushai Hills, the hills bordering South Sylhet and Hill Tippera and in the neighbourhood of Lumding. The success of some of these experiments has unfortunately been greatly prejudiced by delay in the distribution of seed, owing to the illness of the manager of Baikantapur, who was entrusted with the distribution in the last two of the above mentioned areas.

Buri is said to be a variety successfully grown by the aboriginal tribes on the low hills of Chota Nagpur and the Central Provinces. In arranging for its being experimented with in several places, I had particularly in mind the idea that its condition and future prospect in this province should be examined by the Imperial Cotton Specialist who had arranged to pay a special visit to all the cotton-growing areas of this province during the plucking season of 1908. Unfortunately this arrangement broke down, owing to Mr. Gammie having to take the place of Dr. Mann, Principal of Poona Agricultural College, during the latter's illness. It is expected, however, that the deferred visit will be paid next year. The arrangements for growing *Buri* at various places will also be repeated.

In 1908 the Department also supplied on payment seed of Spence's, Dharwar, King s Improved and *Buri* to certain gentlemen in Malda, Rangpur, Mymensingh and Noakhali. The results in these places are not likely to be good, but the Department has no responsibility for them.

Spence's cotton is being cultivated with some success on two plantations in Cachar and one near Sylhet town. In each case the area planted is on low hills. The Department did not supply seed in any of these cases, but gave a free loan of

a Knapsack Sprayer to the owners of Baikantapur and one of the Cachar farms. Many other private experiments are being made with cotton in this province, but mostly on a very small scale. Experiments on the Chittagong "Model" Farm and at other places in that district have been particularly disappointing.

Jute.

21. Jute cultivation having now become established in all parts of the Assam Valley, no demonstrations at Government expense have been undertaken during 1908. Messrs. Forbes and Christie of Upper Assam who were supplied in 1907 with seed and expert jute cultivators, have reported that the experiments conducted by them were not very successful, especially from the financial point of view. They ascribe this chiefly to the want of labour but also to the absence of a permanent water-supply for steeping and to the depressed state of the jute market. In spite of the failure of demonstrations conducted under the auspices of this Department, jute cultivation extended very considerably in the Assam Valley in 1907, but the low prices of jute in that year have caused a great loss of interest in the crop. Those who took most readily to jute cultivation were Cacharies and immigrants from Eastern Bengal (chiefly Mymensingh), but a fairly large number of Assamese also joined.

Two jute farms were started in North Kamrup in 1907 under European management. They are reported to have obtained good yields of first-class fibre, and the labour difficulty has not been as great as might have been anticipated. Experiments are also being continued by tea planters in all parts of Assam, especially Cachar.

The experiments conducted by the authorities of the Assam-Bengal Railway through their station masters along the line from Gauhati to Dibrugarh proved fairly successful. Two samples of the fibre produced were sent for appraisement to a European firm in Calcutta. Their report shows that both samples were fine fibre, of good lustre and strength; too good for most Indian mills, but most suitable for export. Babu Akhoy Kumar Ghosh, an Agricultural Associate of this Department, sowed in his farm at Sibsagar 1¼ seers of jute seed on an acre of land, from which he obtained an outturn of no less than 29 maunds. The fibre was 15′ long, but the colour was bad owing to its being washed in shallow water.

During the year 70 maunds of tested jute seed were stocked for distribution by the Fibre Expert. Requisitions, however, only amounted to some 30 maunds of seed, including 19 maunds for other provinces.

The jute seed grown on the Rajshahi farm in 1906 was used for the demonstrations in the Assam Valley and those on the Assam-Bengal Railway mentioned above. Some seed was also supplied to an Honorary Correspondent of the Department in Mymensingh district, who obtained a yield of 22 maunds of fibre per acre. Large quantities were distributed to cultivators in Rajshahi district, but the reports as to yield obtained are of too vague a description to be quoted.

Experiments in jute cultivation were made in several wards' and Government estates, but they do not appear to have had any definite object or tangible result.

Under the orders of the Local Government, Mr. Finlow, Fibre Expert, paid a visit to Chittagong in March last to enquire into the possibilities of jute cultivation in that district and to arrange for experiments to be made by some reliable cultivators. Mr. Finlow toured in the most likely places in the district as indicated by the Collector, and reported that much of the land he saw was quite suitable for jute. He selected three fields in different localities for experiment. Some expert jute cultivators were engaged under the supervision of officers deputed for the purpose by the Collector. During the first three months they were assisted by a Farm Overseer of this Department, but his services could not be spared longer. Mr. Finlow inspected the three experimental plots in July last, and reported that, except on one field, the crop was doing well.

The Department was not able to render much assistance in regard to measures against insect pests of jute. The Entomological Collector was sent, by request, to investigate an outbreak on the Baroma Jute Farm in North Kamrup. He found that the main injury was being done by "hairy caterpillars," though the jute semi-looper and the jute stem-weevil were also present. He personally showed how the hairy caterpillar can be easily eradicated in the young stage by hand-picking, and the Manager afterwards reported that this measure had been followed with success. The Entomological Collector also attended an outbreak of jute caterpillars in Bogra district and advised the rayats to sweep the infested fields with a hand-net, but was unable to induce anyone to act on this advice. It is certain that with the ordinary rayat no scheme for dealing with insect pests can be carried out except by an Entomological officer of sufficient position and persuasive

power to induce people to follow his instructions. In this way also the services of the Honorary Assistants of the Department can be most valuable, for they can bring their local influence to bear in inducing the rayats to carry out the measures best calculated to save their crops.

Potatoes.

22. The potatoes usually grown in the plains of this province are of the poorest and smallest description, generally over 300 tubers are required to make a seer. It is practically impossible to carry good seed through the rainy season without deterioration. Great improvement can be effected by at least an occasional, if not an annual, renewal of seed stock from the Hill districts. This the Department is endeavouring to do by selling at cost price selected seed of the Darjeeling (Patna seed) and Nainital varieties. In the autumn of 1907 Babu Har Kumar Guha, an experienced Farm Superintendent, was deputed to Darjeeling district to select and purchase good seed of the "Patna red" variety. For Nainital seed we relied on purchases made in Shillong of this type of potato, which is now the variety most commonly grown in the Khasi Hills. At some places where this seed was tried the plants and tubers showed signs of the disease which is always prevalent to a greater or less extent in the Khasi Hills. Therefore, lest the Department should become instrumental in disseminating disease, it has been decided in future not to issue any seed from the Khasi Hills. The old variety of potatoes introduced into those hills by David Scott has been largely displaced by the Nainital variety, but is still grown on a large scale, and, in response to a special requisition, 80 maunds of this round variety were selected and sold to cultivators in Jorhat subdivision. The plants were, to the eye, quite free from disease, and the crop was fairly good. One field measuring a *bigha* ($\frac{1}{3}$ acre) was planted with 5 maunds of potato sets. It had already borne a crop of jute that year, after which it was ploughed and laddered five times, but received no further manuring. No irrigation was given, though the season was unusually dry. The resulting crop was 34 maunds 30 seers, which is quite satisfactory.

One hundred and ninety maunds of Nainital seed were sent out from Shillong. In most cases reports of the results obtained have not been received. But it is known that in one case in Jorhat subdivision 56 maunds were obtained from one *bigha* ($\frac{1}{3}$ acre) after a crop of jute and without further manuring. It is to be noted that the Superintendent of the Jorhat Farm frequently gave instruction to the rayats who were trying our potatoes, and that in other places where no officer was available to give such instruction the results obtained were not so good. At Gopalganj in Faridpur 33 maunds of seed were distributed through an Associate, Mr. S M. Bose, to 40 rayats. The total crop they obtained was 224 maunds. The seed was unusually dry, and no irrigation could be given, but probably more experienced cultivators would have obtained much better results. Babu Basanta Kumar Nandi, an Associate at Baikantapur, in South Sylhet, cultivated Nainital potatoes in two villages adjoining his farm and obtained, with one watering and with cowdung as manure, an average outturn of about 96 maunds from fields which had already borne jute that year. On his own farm, where the land is much higher, the returns were not nearly so good. An Associate in Chittagong obtained only 63 maunds per acre, and explains that this was due to the attacks of red ants. Babu Ashutosh Lahiri, Associate in Rangpur, obtained $97\frac{1}{2}$ maunds per acre, the young plants having been damaged by caterpillars. At Rajshahi seed potatoes were sold by the Farm Superintendent, most of the purchasers sowed Nainital and Patna seed mixed. Though no specially good result was obtained with Nainital seed alone, what can be done with the two varieties mixed was demonstrated in one case at least by a cultivator, who obtained from 19 seers sown on 2 *katas* ($\frac{1}{30}$ acre), manured with cowdung and irrigated 4 times, $10\frac{1}{2}$ maunds of tubers, equivalent to 315 maunds per acre.

Fifty-four maunds of Darjeeling (Patna red) potatoes were selected and purchased. The Jorhat rayats do not seem to have been as successful with this variety as with Nainital, though in one case 25 maunds of tubers were obtained from $1\frac{3}{4}$ maunds of seed. In Rajshahi also the best yield obtained from unmixed Darjeeling seed was 120 maunds per acre. The proprietor of Baikantapur grew Darjeeling potatoes only on his own farm; moisture and cultivation seem to have been deficient, and the average yield was only about 50 maunds per acre. Babu Ashutosh Lahiri of Rangpur, however, obtained from $\frac{1}{8}$ acre manured with cowdung, but not irrigated, the equivalent of 169 maunds per acre.

Major Cole, I.A., has been taking great interest in the extension of potato cultivation in the Lushai Hills, of which he is Superintendent. In the spring of 1908 this Department supplied him with 170 maunds of Nainital, Darjeeling and

" Epicure " seed potatoes. In this case the Nainital seed was selected and purchased in the Calcutta market by the Assistant Director. The " Epicure " seed was obtained from the Bankipur farm in Bengal. The results obtained will be noted in next year's report.

To combat the " black rot " (*Phythophora infestans*) disease so prevalent in the Khasi Hills, demonstrations of the advantages of spraying with Bordeaux mixture were made in June-August 1908 on selected comparative plots on the fields of Khasis in villages near Shillong. The results were very successful, but will be more properly described in next year's report. Demonstrations in spraying were also made on a cultivator's field in Jorhat subdivision by the Superintendent of the farm there. Two equal plots were taken, of which one was sprayed once a month during growth and the other not at all. The former yielded 1 maund 15 seers and the latter 1 maund 12 seers. At Baikantapur Farm and an adjoining village spraying demonstrations were arranged by the Assistant Director. On the farm a plot twice sprayed gave 5½ maunds against 4 maunds on a similar unsprayed plot. In the village a plot once sprayed gave 7 maunds against 6 maunds on the unsprayed check plot.

Sugarcane.

23. Cuttings of the Dacca *gandari* cane, which, as mentioned in paragraph 13, has been so successful, were supplied to the Jaipur Government Estate in Bogra, and are being grown by a selected rayat side by side with the local variety. Cuttings were also supplied to Babu Ashutosh Lahiri, Agricultural Associate in Rangpur, who is growing them in competition with the excellent local cane known as *Vandamukhi*. The Bengal *khari* cane, which has given the best results at Jorhat Farm has been tried for the last three years in the Chittagong Hill Tracts by Kumar Ramani Mahon Rai. It has given excellent yields of *gur*, and is practically immune to pests of all kinds, but the Kumar reports that it takes fully three times as long to crush as the local variety, and is consequently too expensive to grow.

A Renwick 3-roller sugarcane mill was purchased and loaned to a prominent Muhammadan gentleman of South Sylhet for demonstration. Not much interest appears to have been taken in the matter, as is evident from the fact that no one was willing to purchase the mill for use next season. It is intended to send out the mill again for demonstration in some other locality where the old wooden machine is still used.

A set of Hadi's sugar-making apparatus was obtained through the Director of Agriculture of the United Provinces and demonstrations of its use were made first at Rajshahi Farm and afterwards on the sugarcane farm of Srijut Devesvar Gosain in Sibsagar district. The latter demonstration met with such great success that the proprietor has since purchased for himself a larger apparatus of the same type.

Srijut Devesvar Gosain, Associate of Borpathar, in Sibsagar, is demonstrating the value of castor cake as a manure in addition to cowdung on two plots of his sugarcane farm. The results will not be available till the cane is cut.

Rice.

24. We have not yet acquired sufficient information to be able to confidently recommend the introduction of any new variety of rice. The Department always gives its assistance readily to any one who wishes to experiment with new varieties from other districts or foreign countries, but in such cases the Department does not bear any of the expenses of the experiment. Outside of the agricultural stations the only variety experiments made at the cost of Government funds were on the Chittagong " Model " Farm and the Noakhali *khas mahal* garden. On the former Central Provinces fine " *aus* " rice was found to give a smaller yield than the local " *baiam*," but greater than the local " *chiknal*." Assam " *hatisail* " and Burdwan " *dudkhani* " winter rice were contrasted with local varieties and the results are said to have been in favour of the Assam variety. At Noakhali the " *govindbhog* " winter rice of Tippera district was compared with the local variety " *chaplas* ": " *govindbhog* " gave 5¼ maunds and " *chaplas* " 4⅕ maunds on equal plots of $\frac{3}{20}$ths of an acre. Of the many experiments made at the expense of private individuals the only ones that need be mentioned are trials of Bengal " *harmkari* " and of Java paddy by Babu Akhay Kumar Ghose, Associate of Sibsagar. The former yielded over 21 and the latter over 24 maunds per acre. The Java paddy is said to make a particularly good table rice. The great difficulty in regard to introducing improved varieties is that the rayat seems generally unable to obtain a better price for the finest than for the coarsest rice, and so long as this is the case they will not take up the cultivation of a finer variety unless it is also more prolific than the local ones.

As a result of many experiments on agricultural stations, the Department recommends an application of 3 maunds of bonemeal and 30 seers of saltpetre per acre as a manure suitable and profitable for most winter paddy soils. Early in 1908 five of our Associates in various districts were supplied with the material to make a demonstration of this form of manuring and two other demonstrations are being made by the Farm Superintendent on rayats' fields near Shillong; the results will be reported next year. In 1907 a manuring demonstration was attempted in Sibsagar with saltpetre only, but failed owing to the cessation of the rains immediately after the saltpetre had been applied. On the Noakhali *khas mahal* farm the application of saltpetre on a plot of $\frac{1}{20}$ acre caused an increased outturn, as compared with the check plot of 8 seers, equivalent to 4 maunds per acre. Babu Sarat Chandra Chakrabarti, Associate of Gauripur (Mymensingh), obtained on a plot of $\frac{1}{3}$ acre, manured with 10 seers of saltpetre, an increased yield equivalent to 4 maunds 5 seers of paddy per acre over an equal but unmanured plot. Another similar plot manured with 10 seers of saltpetre and 1 maund of bonemeal gave the equivalent of an increase of 4 maunds 23 seers per acre over the unmanured plot. Demonstrations with green manuring for winter rice are being made in 1908 by two Associates, to whom the Department supplied *dhaincha* seed for the purpose.

With the permission of the Local Government, the Department has made a grant of Rs. 500 a year for two years for a demonstration to be made by the Subdivisional Officer of Mokokchang with the object of introducing terraced rice cultivation among the Ao Nagas, who at present do not practice irrigation. A piece of land measuring $8\frac{1}{2}$ acres has been terraced, and rice was planted out at the end of June 1908. Two Angami Nagas have been engaged to instruct the Aos in this method of cultivation. In the Lushai Hills, the Superintendent has made water channels, and is using every means to persuade the people to adopt permanent rice cultivation in the valleys in preference to nomadic *juming*.

Insect pests do great damage to rice crops in all parts of the province. In 1907-1908 they did much less injury than in other years. Many reports of minor outbreaks were received, but usually too late for action to be taken, and until the Department has a competent Entomological officer on its staff it will not be able to render much assistance.

Wheat.

25. Wheat is not a crop that has ever promised to be very profitable in this province. Repeated attempts to introduce it in the plains of Assam have ended in complete failure. In the winter of 1907-1908 an experiment was tried at Lumding in the Mikir Hills, where the climate is comparatively dry. Two maunds of seed were given to a local cultivator and sown on a field selected by the Assistant Director. The outturn was miserable—only equal to the quantity of seed used. It is not proposed to repeat the experiment. The Superintendent of the Lushai Hills reports, however, having obtained some success with small areas of wheat sown at three places in his district, and is repeating the experiment on a larger scale in 1908-1909.

Orange cultivation.

26. The orange tree blight continues to spread throughout the Khasi Hills, with the result of a rapidly diminishing supply of fruit. Unfortunately no assured means have yet been found for checking this disease. The Imperial Mycologist is still investigating the question, and meantime the following measures have been adopted by this Department:—(1) As the fungus appears to spread through the ground and to first attack the roots of the trees, a loan has been taken from the owner of an orange grove of one portion in which all the trees appear to be healthy, and it has been isolated by a trench from the rest of the grove in which some trees have already been affected. It may be that in this way the spread of the disease can be checked. (2) So far as can be ascertained, all other varieties of *citrus* (*i.e.*, limes, lemons, and pomelos) growing in the affected area are immune to the disease. Attempts are therefore being made to bud or graft the orange on one of the other *citrus* trees. To assist in this, the services of an expert grafter are being requisitioned from Nagpur, Central Provinces. Meantime, to make certain that that other varieties of *citrus* are immune a loan has been taken of a badly-diseased orange grove, in which 11 species of *citrus* trees have been planted. After more than 12 months none of them appear to have been affected by the disease. (3) At the end of June 1908, an experiment was tried to save trees already affected by mixing the soil round the roots with slaked lime.

Other crops.

27. Seed of Raipur mustard, ground-nuts, cassava, lucerne, jowar, Ceylon and Bangalore papayas, watermelons, sunflower, sugar-beet and tobacco, plantain shoots, young plants of orange trees and of many English and Indian fruits grown in the Khasi Hills were distributed or

supplied on application to various parts of the province. No very definite results have yet been obtained, though in many cases reports are promising.

CHAPTER IV.

OPERATIONS FOR THE IMPROVEMENT OF AGRICULTURAL LIVE-STOCK.

Poultry.

28. The measures taken for the improvement of the local breeds of cattle are described in the report of the Veterinary Department. During the year 1907-1908 the question of improving the breeds of poultry in this province was taken up by this Department under the orders of Government. It has been decided that for the present operations should be confined to fowls, though the breeding of ducks, geese and turkeys may be taken up subsequently. Noakhali, being a district where poultry breeding is very general, was chosen as it was considered a good sphere for initial enquiries as to the present condition of the industry and the measures necessary for its improvement. In March 1908, Babu Ambica Charan Datta, Deputy Collector, was placed on special duty for this purpose, and has submitted a report giving his conclusions as to the nature and quality of the breeds of poultry reared in the various parts of Noakhali district, the number of fowls and eggs annually exported, the prices realised and the profits obtained by the rearers. To this report he has since added a supplement describing the principal features of the poultry-rearing industry of Chittagong district. The whole report will shortly be submitted to Government together with a Note by Mr. A. A. Meggitt, Agricultural Chemist, who takes a special interest in the subject, and a recommendation that measures for the improvement of poultry in the plains should, in the first instance, be centralised at Dacca, where alone they can be under the necessary constant supervision. The operations at Dacca would follow more or less the same lines as those already adopted for the Lushai Hills, where Major H. W. G. Cole, I.A., has for some time been breeding large numbers of good English fowls and distributing the eggs and young stock among the Lushai villages in exchange for local eggs and birds. At the same time he is inducing the villagers to kill all the local cocks, and in this way several villages already possess none but English poultry, and the work is constantly extending.

Very similar methods will also be followed in the Khasi Hills, where, at the request of His Honour Sir Lancelot Hare, poultry-breeding operations on a modest scale have been commenced at the Fruit Farm near Shillong.

It has been decided that the breeds likely to give the best results to rayats are the Chittagong and the Langshan from China or the Straits. A pen of typical Chittagong fowls was sent to Shillong in September 1908 by Babu Ambika Charan Datta, and through the kindness of Mr. D. Ferguson, of Dhamai Tea Eestate, a pen of Langshans has recently been received.

It is proposed to take up the same breeds for the work at Dacca also, for their special qualities are such as to make them particularly suitable for a hot, damp climate.

CHAPTER V.

SERICULTURAL OPERATIONS.

Superintendent of Sericulture.

29. The Local Government having decided that the best results were likely to be obtained by the sericultural operations in this province being conducted separately, though in close co-operation with those in Bengal, it became necessary to select a separate Superintendent of Sericulture for Eastern Bengal and Assam. The choice fell upon Mr. M. M. Chakrabarti, who had been trained in sericulture in the University of Tokio. He was first placed for 3 months under Mr. A. K. Ghosh, who instructed him in regard to the practices of Bengal and Eastern Bengal silk rearers and the methods adopted in the Bengal Silk Committees' nurseries. On the completion of this preliminary training Mr. Chakrabarti was, on the 30th April 1908, placed in charge of the Baneswar and Kharkhari nurseries in Rajshahi district, but continued to be under the supervision of Mr. Ghosh for a further period of 6 months. Mr. Chakrabarti has acquitted himself well, and proposals for confirming him in the appointment of Superintendent of Sericulture in this province are now under the consideration of Government.

Operations in Rajshahi Division.

30. From the 31st March 1907 till the 30th October 1908, the Bengal Silk Committee continued normally to administer the sericultural operations in Malda, Rajshahi and Bogra, but did little after the 30th April 1908 except to pay the staff employed in Malda. During

the 12 months ending with the 31st March 1908, the Committee incurred on account of operations in this province an expenditure of Rs. 1,640-5-0, which amount has been refunded to them by the Local Government. Most of the expenditure since incurred has also been refunded, and the remainder is now in process of adjustment.

We have inherited from the Silk Committee two small nurseries in Rajshahi district, each managed by a Sub-overseer and a staff of two Sub-overseers and two sericultural teachers in Malda. The duties of the Sub-overseers are to instruct the rearers and to advise them in the purchase of seed cocoons. The teachers conduct classes in two Middle Vernacular schools, situated in important silk-rearing centres. Having been for so long inadequately supervised, I doubt whether these men have done much good, and they are now being put to a practical test by Mr. Chakrabarti with a view to deciding the conditions on which their services may be retained. The Bogra District Board also employs two Sub-overseers, whose duties are similar to those in Malda.

The policy which it has been decided to follow in the attempt to rescue the silkworm-rearing industry from decay follows closely on the lines devised for France by M. Pasteur and those adopted for Bengal. The first and foremost necessity is to make available an adequate supply of seed-cocoons which can be guaranteed as practically free from disease. Given this, any ordinarily capable rearer can make larger profits that can be obtained from any form of field cultivation.

With this object, negotiations have been opened, and are nearly complete, for the acquisition of a permanent site at Mirganj on the banks of the Ganges. On this site rearing houses will be erected capable of producing 1,000 maunds of seed-cocoons a year. When this has been done it is proposed to open a second large grainerie in Bogra district and later on it may be found advisable to establish others in Malda. Should however private enterprise be forthcoming to undertake the management of graineries under adequate guarantees for maintaining the purity of the seed, I should have much pleasure in recommending that Government should hand over the existing graineries and the responsibility for establishing new graineries to any reliable firms that may desire to acquire them.

Meantime, the two small nurseries at Banesvar and Kharkhari will be continued, and the Rajshahi school will also produce a fair amount of reliable seed; but even with the Mirganj grainerie in full working, we shall still only be able to supply a small fraction of the seed-cocoons required for Malda district alone; and if our operations have the effect, which we hope, of reviving silkworm-rearing in Rajshahi and Malda, the supply will become still more inadequate. The opening for useful work is therefore enormous, and it is very unfortunate that private enterprise is not immediately available to meet it.

Rajshahi Sericultural School.

31. The second plan in our sericultural policy is to give a sound practical training to the sons of silkworm-rearers—such a training as would enable them not only to realise larger profits than their fathers by producing cocoons for the ordinary market, but also to make still larger profits by rearing cocoons for sale as seed. The Sericultural School at Rajshahi came under Government management from the 1st January 1907.

Of the twelve apprentices appointed in that month, after resignations and elimination on the result of the half-yearly examination, eight finally remained on the roll. Six of these passed the Annual Examination held in January 1908, and were each awarded a money grant of Rs. 250 to enable them to construct a rearing-house on the plan of the model rearing house at the school. They have also each received a microscope. With the approval of Government similar concessions have also been given to a passed non-paid apprentice, who is a native of Manbhum (Bengal), but now settled in Malda. Each of these students has executed an agreement, that he will finish the erection of the rearing-house within nine months from the date of receiving the advance. Most of them have made some progress in the construction of the house. It is not proposed to strictly enforce the time-limit in this, the first year of this new experiment, but a careful watch will be kept on each of the grantees to see that the money received is used for the purpose for which it was given. The class opened this year on the 1st February 1908, when altogether eighteen students were admitted, including nine paid apprentices and one Government stipendiary from the Khasi Hills. At the end of June 1908 there remained seven paid and seven non-paid apprentices, the others having left in course of the preceding months.

Besides the regular course of instruction, the boys are required to do some practical work in the mulberry field. The half-yearly examination of the school was held after the close of the year under review. Of the nine apprentices who

appeared at the examination, eight passed, including the Khasi student. One non-paid apprentice from Dhenkanal (Orissa) also passed.

The old curriculum of the school which was drawn up for a six months' course has been revised and extended to a period of one year.

The Government of Bengal proposes to send for training some six students annually and to make a proportional contribution towards the up keep of the school. But no definite arrangement has yet been made.

The total receipts of the school, including sale-proceeds of cocoons, amounted to Rs. 671-12-6 during the year under report and the total expenditure to Rs. 5,067-15-5.

I am afraid that the school cannot yet be said to be a success. This is entirely due to the want of a competent head master. We require a man who in practical knowledge is equal to the best rearers in the province, one who is fully acquainted with all those sanitary measures which so largely affect the success of a crop of worm, and one who is also an adept in the use of the microscope. Moreover, he should be a man of sufficient intelligence and tact to be able to impart his own knowledge and of such strength of character as to command the respect and obedience of the students. Such a man is difficult to find, but unless the standard of training and the form of the school are improved, it would be better to close it. The former head master has resigned since the close of the year, and an ex-student of the school has been temporarily appointed in this place. Meantime, Mr. Chakrabarti is endeavouring to find, from among the overseers he is training, one who possesses the qualities which, if developed, would fit him to be entrusted with the permanent charge of the school.

Experiments in other plains districts.

32. During 1907-1908 the Dacca District Board employed a so-called expert to introduce *eri* silk cultivation in that district. The expert proved incompetent, and the experiment was a failure. In Tippera district Babu Anukul Chandra Rai has for some time been experimenting with fair success with the *eri*-worms and has written a Bengali pamphlet explaining the methods of rearing and advocating the introduction of silk-worm rearing as a profitable cottage industry for Eastern Bengal. His experiments have not however been on a sufficiently large scale to be conclusive. Several years ago some European planters made experiments in *eri* cultivation which ended in failure, owing to the sudden and complete destruction of the castor plants by insect pests. Mr. Lefroy, the Imperial Entomologist, informs me that with the knowledge now possessed of the life history of these pests and of the methods by which they can be kept in check there need be no fear of a similar disaster again occurring. If such is the case, there is here another good opening for private enterprise.

Operations in the Khasi Hills.

33. The experiments in rearing the European univoltine silk-worm at the Fruit Farm, Shillong, were repeated in 1908 and proved as successful as in previous years. Samples of the silk produced were sent to the Bengal Silk Co. and evoked most flattering encomiums. A full account of the experiments will be found in the Annual Report on the fruit farm. Khasis are taking a steadily increasing interest in the subject of silk-worm-rearing. During 1908 many thousands of mulberry cuttings have been sold to them at a low price. These have all been planted out, and by the time the trees have been established and rearing-houses have been built the demand for seed will be great. The most favourable point in regard to the Fruit Farm experiments is that they indicate that silk-worms suffer no degeneration even after being reared for three successive years in the Khasi Hills. In this respect we are much more fortunate than Kashmir, and the outlook for the establishment of a silk-rearing industry in the neighbourhood of Shillong is distinctly promising.

As announced last year, the Government offered stipends and travelling expenses for two Khasi boys to enable them to be trained at Rajshahi Sericultural School. The value of the stipends was subsequently raised to Rs. 10 each per mensem. A condition to the grant of a stipend was that the youth must, before leaving Shillong, have planted out two acres of his land with mulberry, and that his relations must sign an agreement that on his return from Rajshahi they would establish him in business as a rearer. On these conditions only one boy was found willing to accept the stipend. The Government has again offered two stipends for the year 1909, and only one candidate has come forward; but when these two have started work there will perhaps not be much necessity for sending more Khasi students to such a distant place as Rajshahi, where they are handicapped by not knowing Bengali.

CHAPTER VI.

DEVELOPMENT OF OTHER INDUSTRIES CONNECTED WITH AGRICULTURE.

Hand-loom weaving.

34. A report on the present position of the hand-loom weaving industry in this province embodying accounts of various attempts made in the past for its improvements and proposals regarding the lines on which future efforts should be made was submitted to Government in February 1908. The whole subject is still under the consideration of Government, though orders on certain points were received at the close of the year. The two weaving instructors whose services were obtained in May 1907 from the National School of Weaving, Calcutta, were retained for the purpose of demonstration of improved hand-looms at various important weaving centres in this province. In July 1907, they were sent from Shillong to Jorhat at the request of the Exhibition Committee there, under whom they worked for over six months. The main object in sending them to Jorhat, *viz.*, to teach Assamese women the use of improved loom, was only achieved to the extent of imparting a modicum of training to two women at the Mission School. Five Brahmin boys, who professed a liking for and acquired a certain amount of skill in weaving with the Salvation Army loom, proposed to borrow Rs. 800 from the Local Co-operative Credit Society with which to purchase four large looms of the same type, but it is understood that the proposal came to nothing.

In the first week of March the instructors were deputed to Rajbari (Goalundo), but as they showed constant slackness and lack of interest in work, their services were dispensed with from the 2nd April 1908.

While afterwards efforts were being made to obtain the services of one or two trained weavers, the authorities of the Salvation Army kindly offered to send one of their European Factory staffs with a Tamil weaving instructor to visit this province for the purpose of introducing the use of their "Triumph Automatic" loom which gained the first prize at the Calcutta Exhibition of 1907. They visited Dacca, Tangail (Mymensingh), Rajbari (Goalundo), Chittagong, Dagonbhuyan (Noakhali), and exhibited the working of the loom. In most places the demonstrations attracted the notice of weavers, but the educated classes took more interest. Owing to their unfamiliarity with the Bengali language, the shortness of their stay at each place and other causes, the representatives of the Army failed to create any permanent impression except in Dacca, where their visit has led to the opening of a weaving class by the District Board. They intend, however, to renew their tour in this province at an early date, and to spend a longer time at each place, so that they may obtain an all-round experience of the most up-to-date methods of weaving.

A weaving instructor is being employed by the North Sylhet Local Board on a salary of Rs. 45 per month. His duties are at present confined to visiting in succession three weaving centres in that subdivision and training the weavers in the use of the fly-shuttle. It is reported that several local weavers have already been trained and that in one village four Serampur fly-shuttle looms are now working. Commissioner Booth Tucker also proposes to send a woman officer and a native girl assistant to Assam, where weaving is practically confined to females. The Director of Public Instruction has recently expressed his general approval of the girls' schools in Assam being used as centres for the instruction of women and girls.

It is also proposed to send an expert weaver from Dacca to go through a regular course of training at the Salvation Army Loom Factory at Bombay and other places.

Other industries.

35. Pending the appointment of a Director of Industries this Department is constantly called upon to advise on industrial and commercial questions. The Department is also engaged on its own account in some industrial experiments. For instance, cigars and cigarettes are manufactured at the Rangpur and Burirhat farms. Lemon-grass oil is distilled at the Wahjain plantation, and experiments have been made in the tinning of fruits and vegetables. Details of the experiments with cigars, cigarettes and lemon-grass oil will be found in the annual reports of the farms. The manufacture of cigars and cigarettes was only started as a means of ascertaining whether suitable tobacco was being produced on the farm. But as it is now realised that the only way to decide this point is to have the tobacco valued by commercial experts, and it is proposed to stop making cigars and cigarettes, which only introduce an unnecessary complication and needlessly arouses resentment against Government interference with trade.

Experiments on a small scale have been made in the canning of pineapples at the Fruit Farm, Shillong. The experiments were conducted by the Assistant Director, Mr. Basu, with tools and cans obtained from Calcutta and with fruit purchased locally.

The cost of producing a 2-lb. tin of fruit amounted to 4½ annas. The fruit has been found to remain good in the cans for 5½ months, and some is being kept to ascertain how much longer it will remain fresh. In the plains, where fruit, sugar and tins, and also labour, are much cheaper, pineapples can be tinned at a much lower cost. The fruit grows in abundance in the southern slopes of the Khasi Hills, at places like Shella, Bholaganj, and Theria, and in pargana Jaldhup in Karimganj subdivision of Sylhet district. Further canning experiments will be made next year at the Wahjain tropical plantation, which is near Theria, and not far from Bholaganj.

An experiment was also made in the tinning of cauliflowers and peas, samples of which were shown at the Jorhat Exhibition. The experiment was successful, as far as it went, but the vegetables had been in the cans too short a time to afford a complete test.

The Assistant Director and I make a special point of interesting themselves in the establishment of new industries, and particularly in the opening of factories. Among others, the new cotton ginning mill at Chittagong, the tobacco factory at Rangpur and a soap factory at Dacca were visited, and such information and assistance as could be furnished was freely given to the proprietors. Endeavours have also been made to encourage and help the inventors of new machines and new products. Among others may be mentioned the inventors of a new earthenware roofing tile, similar to those of Raniganj, made at Itakhola, Assam-Bengal Railway, a new method of modelling in papiermache, an ingenious spinning machine invented by a Mahommadan mistri of Silchar, various modifications of the Serampur fly-shuttle loom, of which the most promising is perhaps that produced at Kalikatcha in Tippera, where also a machine for making matches has been invented. Of new agricultural products, concerning which the advice of the Department has been asked, the following deserve special mention:—Starch, obtained from the rhizomes of a very common wild plant called *shati* (*Curcuma zedoria*), which is of high feeding value and also very suitable for most of the purposes for which rice starch is now used. Samples of starch from cassava root, tapioca and arrowroot have also been received for valuation and advice. Many samples of fibre from indigenous plants have been reported on by the Fibre Expert. An enterprising Khasi has distilled from the bay-leaf (*Cinnamomum tamala*) an oil of great pungency, but the valuation received is not encouraging.

Various questions connected with the enquiries precedent to the initiation of a scheme for the improvement of the fisheries in this province have been referred to this Department. In particular, Mr. Basu has investigated the question of the supply of decayed fish available for use as manure. The results so far go to indicate that the supply is far less than one would have anticipated.

Mr. J. N. Gupta, I.C.S., has recently concluded his industrial survey of the province. During his inquiries all the information and statistics available in the office of thi Department were freely placed at his disposal.

CHAPTER VII.

AGRICULTURAL EDUCATION.

Agricultural training in public schools.

36. During 1907-1908 there was no agricultural class associated with any of the secondary, primary or technical schools in this province. The subject of agricultural education in public schools was discussed at a Conference held on the 19th March 1908, at which Mr. R. Nathan, C.I.E., the Officer on special education duty in the Secretariat, Mr. H. Sharp, Director of Public Instruction, and myself were present. It was agreed that at present very little direct agricultural teaching can be given in the higher schools, but that in the village or lower primary schools a course of practical nature-study lessons should form a prominent feature in the curriculum. At the close of the year I submitted proposals regarding the selection of a suitable officer for the training of village schoolmasters in methods of education by observation of nature.

A comprehensive note by the Director of Public Instruction on the subject of agricultural education in Eastern Bengal and Assam is subjoined as Appendix IV of this report.

Deputation of students to Poona Agricultural College.

37. The arrangement made in 1906-1907 for sending three students for a three years' course at Poona to be followed by a two years' post graduate course at Pusa were repeated in 1907-1908. Two students were selected, but one could not join owing to illness at the commencement of the session.

The three students who were sent to Poona in 1907 are reported to have made good progress in their studies, and one of their number has secured a high position in the annual examination.

Deputation of students and officers to Pusa Agricultural College.

38. Mr. J. N. Chakrabarti, newly appointed Agricultural Supervisor, has been deputed to Pusa from 1st June 1908 for a course of practical training in Indian agriculture for twelve months under the Imperial Agriculturist. Babu Jamini Kumar Biswas, Superintendent of Rangpur Farm, was sent to Pusa in October 1907 for special training under the Imperial Agriculturist in methods of reactitude in agricultural experiments. He returned on the 3rd January 1908.

Two students selected at the close of the year for the posts of Mycological and Entomological Collector in this Department are also being trained at Pusa under the Imperial experts. In each case the period of training will not exceed twelve months.

As suitable candidates were not yet forthcoming for the post of Farm Overseer the Fieldman Clerk of Dacca Farm was sent to Pusa for six months' training, with effect from the 6th June 1908.

Practical training of sons of cultivators.

39. It is proposed to admit five apprentices annually to the Dacca Farm, with a view to train them in the best methods of cultivation so that they may be available either for service as fieldmen demonstrators or may become pioneers in a private capacity of the nearer and more profitable agricultural processes. The course will be entirely practical, and will extend over two years, during which the apprentices will receive stipends of Rs. 15 per mensem. When qualified, they will be offered the appointments of fieldmen demonstrators on Rs. 25—1-8—40 per mensem.

Four boys were selected at the close of the year, and are now under training The Puthia Charani Wards Estate in Rajshahi offered five scholarships of Rs. 10 each to sons of cultivators tenable at the Rajshahi Farm, but only two students joined the farm, and they too left without finishing the term. Proposals have been submitted to the Director of Public Instruction for the establishment, as an experimental measure, of courses of practical instruction in the grafting and budding of fruit trees at the Fruit Farm, Shillong.

Provincial Agricultural College.

40. It has been decided that for the present no separate Agricultural College should be established for Eastern Bengal and Assam, but that the Local Government will contribute one-third of the estimated cost of upkeep of the new Agricultural College in Bengal for the first eight years of its existence, and that during that period this province will be entitled to send fourteen students, representing one-third of the expected average yearly admissions. It is expected that the Bengal College will be opened in October 1909.

Veterinary College.

41. Similar arrangements have been made with the Government of Bengal for the training at Belgachia of the Veterinary Assistants required for this province. Further information on this point will be found in the report of the Veterinary Department.

CHAPTER VIII.

EXHIBITIONS AND SHOWS.

Jorhat Exhibition.

42. Of the Exhibitions and Shows held during 1907-1908 pinch of place must certainly be awarded to the Jorhat Exhibition. The credit for its organization and success is chiefly due to Messrs. Sachse and G. C. Nag, successive Subdivisional Officers, Messrs. Ferguson, Shewers and J. D. Gupta, members of Committee, and Messrs. Basu, J. N. Chakrabarti, and R. D. Gupta, of this Department. A brief description of the Exhibition has been published in the *Agricultural Journal of India* for July 1908. It is perhaps unnecessary in this place to say more than that this Exhibition was well-managed, and probably the best that has ever been held in this province.

Shillong Show.

43. The fifth annual Show of field and garden produce was held in Shillong on the 13th and 14th May 1908. Owing to the great success of the Show last year and to the impossibility of dealing properly in one day with an overwhelming number of exhibits the Show was extended to two days. This innovation has justified itself, and it is proposed to make similar arrangements next year. The number of spectators on both days was considerable, and His Honour Sir Lancelot Hare visited the Show on both days. The number of exhibits registered was 1,719, and included vegetables, orchids and other flowers,

rare plants, fruits, dairy produce, honey, poultry, cattle, wild ferns, fibre plants, etc. Owing to the drought which had prevailed for some months before the Show, neither vegetables nor flowers were up to the usual standard of the Khasi Hills in the middle of May. Ninety-four money prizes, aggregating Rs. 518, were awarded. It is intended to gradually develop the importance of the agricultural side of the Show, and to pay possibly less attention to the horticultural. In particular, now that it has become a recognised annual institution, it will be utilised to demonstrate to Khasi cultivators the pecuniary advantages of improved implements and new crops.

Other agricultural Shows.

44. Agricultural Shows were also held during 1907-1908 at Faridpur, Rangamati (Chittagong Hill Tracts), and Falakata (Jalpaiguri). A grant-in-aid of Rs. 200 was given by this Department for each of the Shows. The Faridpur Exhibition was not a success, and I am in full agreement with the Collector's remark that, unless and until the Show is put on a better footing, it should receive no grants whatsoever from Government. The Agricultural and Industrial Exhibition, held at Rangamati on the 14th and 15th February 1908, was fairly successful, considering that the people to be attracted are all hill tribes. The Chakma Chief, representative of the Bohmong Chief, and 100 headmen were present at the Exhibition, which was also visited by the Commissioner of Chittagong Division. Of the two fairs, Alipur and Falakata, which are kept up in Jalpaiguri districts mainly for political reasons to encourage trade with Bhutan, the former was not held this year. The Falakata Fair commenced on the 6th February 1908 and lasted for three weeks, seemed to attract a fair amount of trade, but very few Bhutias attended, and the utility of these semi-political Shows appears to be doubtful.

A Cattle Show was held in Sylhet in January last. Three hundred and thirteen head of cattle were exhibited and 23 prizes were awarded by the North Sylhet Local Board. The Show is to be repeated in January 1909.

The people of this province do not readily take to the idea of Shows, but it is probable that much the same effect is produced by the Fairs, which are very common, especially during the cold weather. I believe that much good work can be done by the officers of the Agricultural and Veterinary Departments, attending and making use of these Fairs, to acquire information as to existing conditions and to spread among the people the knowledge of the improvements which we can introduce to them. With this object, a list of the annual Fairs and Shows, and of the dates on which they are held, is being prepared in my office, though it will be impossible to do much till the superior staff of the Department is strengthened.

CHAPTER IX.

COLLECTION AND SUPPLY OF INFORMATION.

Agricultural publications.

45. The following bulletins and leaflets were published during 1907-1908 :—

Bulletin No. 17.—Important Insect pests.

Bulletin No. 18.—On *jhum* cultivation in the neighbourhood of Lumding.

Bulletin No. 19.—On Bordeaux mixture as a preventive of potato disease.

Bulletin No. 20.—On coffee cultivation in the Khasi Hills.

Bulletin No. 21.—On potato cultivation.

Leaflet No. 1 *of* 1907.—On jute cultivation.

Leaflet.—On orange blight in the Khasi Hills.

Leaflet No. 1 *of* 1908.—On the red-rot disease of sugarcane.

All of the above have been published in English. Bulletin No. 21 and leaflets No. 1 of 1907 and 1908 have also been published in Bengali and Assamese. Bulletins Nos. 19 and 20 and the leaflet on orange blight have been issued in Khasi. Bulletin No. 17 has also been published in Assamese and a revised version in English and Bengali will shortly be issued.

All of these publications are distributed, in the first instance, to District and Subdivisional Officers, the Honorary Correspondents of the Department, and others. All requests subsequently received for further copies are complied with without charge. As soon as the supply of any pamphlet runs short it is reprinted.

Some of the leaflets published by the Bengal Agricultural Department have also been distributed among the Honorary Correspondents.

At present there is no departmental journal, but it is proposed to subsidise a private vernacular journal for the dissemination of information and advice regarding agriculture. Copies of the *Agricultural Journal of India* and of the *Bengal Journal* are circulated to all Sibpur graduates and to scholars of this province studying at Poona.

Copies of Mr. N. G. Mukharji's "Handbook of Agriculture" and "Saral Krishi-Bijnan," an agricultural primer in Bengali, were purchased and distributed among District and Subdivisional Officers. Some copies of "Resham-Bijnan," a Bengali primer of sericulture by same author, have also been ordered for presentation to the library of each Vernacular and High School in the silk-rearing areas of Eastern Bengal and for the students of the Rajshahi Sericultural School.

Copies of a book entitled "Jute in Bengal" by Babu N. C. Chaudhuri, of the Bengal Agricultural Department, have been purchased and distributed among local officers. Materials are being collected for the preparation of a complete list of the principal economic plants grown in Eastern Bengal and Assam, with their English, vernacular and botanical names.

Agricultural statistics and forecasts.

46. The following crop forecasts are at present issued every year:—

Rice	5
Cotton	4
Oilseeds	4
Wheat	3
Jute	2
Sugarcane	2
Miscellaneous *rabi* crops	2
Miscellaneous *bhadoi* crops	2

These are based in on reports furnished by District Officers, checked as far as possible by information received from Honorary Correspondents and others. I find that gradually the reports received from Honorary Correspondents are becoming more complete and more accurate than those furnished by District Officers, most of whom have no adequate agency for supplying them with reliable or intelligent information regarding the state of the crops.

As our system of forecasts is defective in many respects, proposals for recasting it have been submitted, and are still under the consideration of Government.

At the close of the financial year the character of the seasons and the harvests obtained are reviewed in Season and Crop Report. Most of the statistics appended to that report are repeated in a slightly different form and combined with some revenue statistics in a publication called *The Agricultural Statistics*. Proposals have been submitted to Government, and are still under consideration, for modifying the statements in the Season and Crop Report to bring them into conformity both with the conditions of this province and with the form of the Agricultural Statistics. The special reports on tea culture and on the production of coffee have now become a part of the work of my office and the first were issued for the year 1907.

Early in 1908 a revision of the results obtained by experimental harvestings of various crops during the preceding five years was published and used as a basis for determining what should for the present be accepted as the normal outturn per acre of the various principal crops of this province.

Notes have also been submitted to Government regarding the high prices of rice that have been prevailing for the last three years, and in this connection a separate note was issued regarding the extent to which jute land yields a second crop in the same year. A preliminary Note on the weights and measures in general use in Eastern Bengal and Assam was also issued.

Honorary Correspondents are supplied free with copies of all forecasts, the Season and Crop Report, and the Departmental Report. During 1907-1908 they were also given copies of the notes on the double cropping of jute land, on weights and measures, and on the normal yields of principal crops.

Weather and Crop Reports.

47. The weekly Weather and Crop Reports published in the Government *Gazette* are received from District Officers and edited and summarised in my office, which is also called upon to furnish special statistics regarding any district in which there may be an apprehension of scarcity or famine.

Rainfall statistics.

48. As there is no separate Meteorological Reporter for this province, the supervision of rainfall registration and the compilation of monthly and annual returns is done in my office.

Trade statistics.

49. Statistics of the trade of the province carried by rail and river are published from my office quarterly and annually, and in the latter case are accompanied by a review of the year's trade and prices. Returns of the trade with trans-frontier tribes are issued monthly and yearly. In 1908 a report of the tarns-frontier trade for the three years ending with the 31st March 1908 has been published. A scheme for the complete registration of the trade of Chittagong Port has been sanctioned by Government and preliminaries are being settled in consultation with the Port Commissioner and the Director General of Commercial Intelligence.

Prices and wages.

50. Fortnightly returns of wholesale and retail prices current are compiled in my office. A scheme has been submitted to Government for modifying the present system of reporting wholesale prices in such a way that returns for each commodity will be received from those marts where the largest quantities of it are bought and sold.

Half-yearly returns are also published showing the prevailing rates of wages in each district for agricultural and other labourers. Proposals for replacing this unsatisfactory arrangement by a quinquennial wage census, based on the scheme revised by Mr. Moreland for the United Provinces, were submitted to Government in August 1907, but no orders have yet been received.

CHAPTER X.

ARBORICULTURE.

51. During 1907-1908 this Department was charged with the duty of arranging for the planting of avenues and clumps of trees in the new civil station of Dacca. A nursery was started with some plants obtained from the Royal Botanic Garden, Calcutta, and others procured locally. Several of these have been issued for the laying out of new compounds, and since the close of the year a commencement has been made in planting the roadside avenues. A special design for a neat and inexpensive gabion has been produced, and will be adopted throughout the roads of the new station.

At the instance of Sir Lancelot Hare a nursery for ornamental shrubs and plants has been established at Shillong since January 1907. From this plants are supplied for roadsides and other public places, and the surplus is at present distributed gratis for the improvement of private compounds. The nursery is supervised by the Superintendent of the Khasi Hills Farms.

Since the close of the year the Local Government has issued orders charging the Director of Agriculture with the duty of advising District and Local Boards on all arboricultural operations. I have also been required to prepare a manual of arboriculture, and to supply the Boards with model working plans. As it is obviously beyond the power of the Director to carry out all these duties, I have submitted proposals for the engagement of an arboricultural expert, to whom may be entrusted the duty of laying out public grounds for the advancement of our principal civil stations, and of advising on arboricultural operations generally throughout the province.

I have the honour to be,

SIR,

Your most obedient Servant,

S. G. HART,

Director of Agriculture, Eastern Bengal and Assam.

SHILLONG,
The 1st January 1909.

APPENDICES.

APPENDIX I.

REPORT ON THE WORK DONE BY THE FIBRE EXPERT.

Experiments with jute at Pusa.

In an account of the work done in fibres during the year 1906-1907 the lines were described on which a study is being made of the races of jute grown in Bengal and Eastern Bengal, the object in view being the improvement of the crop, both as regards yield and quality of fibre.

This investigation, in which the author is collaborating with Mr. Burkill, the Reporter on Economic Products to the Government of India, has proved to be a complex one. There are in the two Bengals about one hundred so-called races of jute, and it was obviously necessary as a preliminary to any further work to bring them together, and compare one race with another, so as to discover how far they differ from, or are identical with, each other. It was soon found that many of the so-called races were not pure, *i.e.*, they contained a considerable admixture of other obviously different ones. Therefore, before any real comparisons could be made, these races had first to be purified by selection.

A tentative account of the conclusion at which we have so far arrived is embodied in Agricultural Ledger No. 6 of 1907. These conclusions are at once the result of personal observation over several years on—

(*a*) Crops in the field as grown by the rayats.

(*b*) Plots grown side by side from seed obtained from the various districts, and purified by selection.

(*c*) Herbarium specimens collected in various districts during the last eight years.

In the first place it has been found possible to reduce the number of races of *C. capsularis* from upwards of one hundred to thirty-three and of the residue there are many which seem for all practical purposes identical, and which are only being kept apart, pending further observation.

Broadly, it may be said in fact that the races of *Corchorus Capsularis* tend to classify themselves under four main heads, *viz.* :—

(*a*) Early red-stemmed races.

(*b*) Late ditto.

(*c*) Early green-stemmed races.

(*d*) Late ditto.

There is at least a month between the times of ripening of the earliest and latest races; but there are intermediates. There is also a very obvious distinction between the deepest-red-stemmed races and the pure green ones; but here again there are intermediates.

Some of these intermediates differ from each other only very slightly, yet they are not absolutely identical; for instance, one pure green race may ripen a week earlier than another, again, two races may seem identical in all respects, except that one has red leaf petioles while those of the other are green. Therefore, under each of the four main heads given above we have maintained separate, for the present, several races which only exhibit slight differences such as these. Only further study will show whether such differences are permanent or not. Meanwhile, a partial chemical and microscopical examination of the respective fibres extracted from plants of the various races tends to indicate that one race differs very little from another as regards the composition of its fibre.

The conclusions drawn from our observations in the field are thus supported by independent evidence. Under these circumstances, in view of the distinctions as regards quality made in the jute trade-distinctions, it is worth noting which are rather geographical than otherwise, it becomes important to ascertain the effect of soil, of climate, and especially of the retting water on the quality of fibre produced. Experiments have therefore been devised for the present season which will, it is hoped, throw light on these points.

Cross-breeding experiments.—As a result of the preliminary work by selection described above, we have now one or two races which we consider pure. We are therefore in a position to commence the breeding of new races by cross fertilisation, and this we have already done. It remains for time to show whether it will be possible to bring about any great improvements by this means. In view of the comparatively slight differences which exist between the various races, it is hardly to be expected that such advantages will accrue in the case of jute as have been brought about by cross fertilisation work with other crops. In any case, however, the experiments are bound to yield valuable information, which will render clear many points which are now obscure.

EXTENSION OF JUTE CULTIVATION IN THE CHITTAGONG DISTRICT.

Although jute is well known in the district of Chittagong, it has hitherto been cultivated only as a garden crop, partly for use as a vegetable, and partly to supply material for ropes to be used ain the homestead. It has never been grown as a field crop on a sufficient scale to allow of an export trade.

At the instance of Mr. Luson, the Commissioner of Chittagong, and of the Director of Agriculture, the author made a tour in the district during March of the present year (1908), as a result of which it was decided to carry out a series of demonstrations in three parts of the district—

(*a*) At Nichintapur in the Hukla Valley;

(*b*) At Rajabari, 30 miles up the Kornaphulli on the ChakmaRaj estate;

(*c*) At Dohazari on the Sangu river on the estate of Salamat Ali Khan.

A special grant of money was obtained for the purpose, and expert cultivators, engaged by Mr. Morgan of Narayanganj, were imported. So far, the experiment promises to be a distinct success. Although the early part of the season was very unfavourable, so that sowing could only take place at the beginning of May, the crops, with one exception, are all good, and one is excellent.

While it is not expected that these demonstrations which one shall repeat next year, if possible, will induce an immediate wholesale cultivation of jute, it is hoped that the ryots will thereby gradually be persuaded to take up the crop.

As far as soil and climate are concerned, it may be said that practically the whole district is suitable. Moreover, the population in many parts is so dense that a large number of the inhabitants go annually to Burma to work as coolies in the rice-fields. There is therefore no lack of labour which is so important a factor in successful jute cultivation. Nevertheless, the extension of the crop will probably be influenced less by these conditions than by the prevalence of steeping water, which is hardly likely to be available in sufficient quantity in some tracts.

The experiment is an interesting one from a broader point of view. It is felt that means of bringing improvements in agricultural practice before the cultivator are at present to a large extent lacking. The average cultivator is inclined to fight shy of a visit to a Government experimental station, even if there is one sufficiently near to allow of it; but it is hoped that more or less informal demonstrations, such as those carried out on the cultivator's own land, and largely by men of his own class, will appeal to him. The method has met with some success in other parts of India.

Distribution of seed.—During the present season, about thirty maunds of jute seed, tested and guaranteed to be of good quality, were distributed by the Department. The smallness of the amount, compared with that distributed last year (about 75 maunds), is accounted for by the decreased demand, due to the considerable shrinkage of area devoted this year to jute.

Jute experiments in other provinces.—Experiments with the object of introducing jute cultivation continue to be made in (*a*) Bombay Presidency, (*b*) the Central Provinces, (*c*) Madras Presidency, and (*d*) the Punjab.

Bombay.—At Ganeshkind, near Poona, progress was made last season (1907) in that one plot yielded a small profit for the first time after deducting all costs of cultivation. This year's crop is described by Professor Gammie as being still more hopeful; especially as experience in dealing with the crop in enabling cultivation expenses to be reduced. Experiments at Dharwar (Karnatic) also said to be promising.

Central Provinces.—In 1907 trials with jute, under partial irrigation, at Nagpur and Raipur were successful enough to warrant the growing of the crop this year on two demonstration farms. The yield of the Nagpur plot in 1907 was at the rate of 18¾ maunds per acre and the fibre was valued at Rs. 6 per maund, representing a gross outturn of Rs. 112 per acre.

The success of this year's demonstration has been adversely affected by the unfavourable weather during the early part of the season; but the yield of a crop at Telsakeri, near Nagpur, is estimated by the Deputy Director of Agriculture at 18 maunds per acre.

Experiments are being made to ascertain the possible place of jute in the rotations of the Chattisgarh and Nagpur Divisions.

Madras.—Experimental cultivation of jute is being persevered with on a considerable scale this year at Tanjore in the Cauveri Delta and also on the Malabar Coast. The Tanjore plots are not very successful, but in Malabar, whose climate is somewhat similar to that of Lower Bengal, some of the trials promise to give very satisfactory results, one crop having reached the height of 9 feet after two months' growth.

The Madras Agricultural Department is making efforts to create a local market for the fibre produced.

The Punjab.—In 1907 several very successful plots of jute were grown at Lyallpur in the Chenab Colony. The average yield was about 11 maunds per acre; but the outturn of individual plots was considerably greater.

A severe attack of caterpillars has unfortunately injured the prospects of this season's crop.

Although there is little doubt that jute could be successfully grown in the Chenab Colony, the fact that the whole tract depends almost entirely on intermittent irrigation for its water-supply would probably render the retting of a large crop more difficult than it might otherwise be.

INVESTIGATION INTO THE DETERIORATION OF BALED JUTE.

About a year ago, the author, in collaboration with Messrs. Cross and Bevan, of London, commenced an investigation into the deterioration which some jute undergoes after baling. The deterioration which sometimes takes place in the course of a few weeks is characterised by a complete change in the nature of the fibre; for, instead of remaining a substance of considerable tensile strength, it becomes so brittle as to be capable of being rubbed into a fibrous powder. In this state, in which it is said to be "heart-damaged," it is, of course, entirely useless for spinning purposes. The evil is a serious one, for during the season 1906, 3 per cent. of the total imports of jute into Dundee are said to have been rejected on account of "heart-damage."

So far, the investigation has practically confined itself to a study of the causes which produced "heart-damage" and some progress has been made in this direction; but indications have also been obtained that a simple and inexpensive treatment of the jute before or during baling may suffice to prevent subsequent deterioration. More work is, however, required before any really definite statement can be made.

FIBRE CROPS OTHER THAN JUTE.

Flax.—Experiments with flax were continued at Dooriat, where about 150 acres were sown, and also at Pusa during the season 1907-1908. The crops were grown under the advice of M. Vander Kerkove, the Belgian flax expert in the employ of the Bihar Planters' Association, and the straw produced is a great improvement on that of the previous year both in quantity and quality.

There is now little doubt that, in an ordinary season in Bihar, flax is capable of producing a fairly handsome profit, which M. Vander Kerkove estimates at Rs. 74 per acre.

Small plots of flax grown at the Dacca Experimental Farm and at Silchar by Mr. Crozier yielded straw of sufficiently good quality to warrant further trials, which will be extended in the Assam Valley during the coming season. An illustrated pamphlet is about to be issued, describing, with special reference to Eastern Bengal and Assam, the cultivation required, and the methods used in the extraction of flax fibre. Meanwhile, it may be stated that flax has considerable advantages over other fibre crops, such as sisal or jute:—It does not require a very large amount of labour; nor is the machinery, even for a large area, other than of the simplest. Moreover, it is only a one-season crop, so that no large initial outlay of money has to be sunk for several years without any return. If it can be cultivated successfully in Assam, as the trials mentioned above tend to indicate, it should prove a really valuable cold-weather crop.

Sida.—Experiments with this crop, which are being continued, indicate that, in order to produce the length necessary for a fibre plant, it must be grown on well-drained land of good quality, either in a moist climate or (possibly) with irrigation. Under these conditions promising results have been obtained. Further work is, however, necessary before the crop can be recommended for general cultivation. In the meantime, it is important to know that it would not be necessary to create a new market for *sida:* both the Indian Jute Mills Association and London Brokers having expressed the opinion that it would find a ready sale on rather better terms than ordinary jute.

A systematic investigation of other fibre-yielding plants is in progress. There are a number of Indian plants which yield fibre of a valuable nature; but, before recommending them for commercial exploitation, it is necessary to investigate not only their agricultural possibilities but also the best method of extracting the fibre when the crop has been grown. Moreover, the disposal of small quantities of a new fibre in existing markets, or, if this cannot be done, the creation of a demand for it, is often a question of prime importance in considering the chances of its profitable development.

Information on this subject will be published from time to time as it becomes available.

CAMP JALPAIGURI:
11*th September* 1908.

ROBERT FINLOW,
Fibre Expert, Eastern Bengal and Assam.

APPENDIX II.

LIST OF HONORARY CORRESPONDENTS OF THE DEPARTMENT OF AGRICULTURE IN EASTERN BENGAL AND ASSAM.

ON THE 30TH JUNE 1908.

Dacca.

1. Rai Hara Sankar Choudhuri, Teota, Dacca.

Mymensingh.

2. Babu Chandra Kishore Day, Sibganj, Mymensingh.
3. Babu Iswar Chandra Guha, Jamalpur, Mymensingh.
4. *Babu Sarat Chandra Chakrabarti, Gouripur, Mymensingh.

Faridpur.

5. Babu Kali Prasanna Sarkar, Faridpur.
6. *Mr. S. M. Bose, Gopalganj, Faridpur.

Bakarganj.

7. Babu Atul Chandra Dutt, Barisal.
8. Revd. W. Carey, Barisal.

Chittagong.

9. Raja Bhuban Mohan Roy, Chittagong.
10. *Babu Iswar Chandra Nandi, Fatehabad, Chittagong.

Rajshahi.

11. Babu Kishori Mohan Chaudhuri, Rajshahi.
12. Babu Sarat Chandra Roy, Rajshahi.

Dinajpur.

13. Babu Purna Chandra Sinha, Rajganj, Dinajpur.

Rangpur.

14. *Babu Ashutosh Lahiri, Rangpur.
15. Babu Rajani Kanta Bhattacharjee, Rangpur.

Bogra.

16. Babu Baidhyanath Sanyal, Bogra.
17. Babu Jogendranath Sarkar, Bogra.
18. Babu Kashinath Das, Bogra.

Cachar.

19. *Babu Man Gobind De Chaudhuri, Silchar.
20. H. Weir, Esq., Kallein Tea Estate, Cachar.

Sylhet.

21. Babu Abhaya Kumar Dam, Sadhuhati (South Sylhet).
22. *Babu Basanta Kumar Nandi, Itakhola, Sylhet.
23. D. Ferguson, Esq., Dhamai Tea Estate, Dakshinbhag Post Office, Sylhet.
24. Babu Girijanath Biswas, Kanairkhal Post Office, Jagannathpur, Sylhet.
25. Babu Har Kissor Gupta, Post Office, Pail, Habiganj.
26. Babu Joy Chandra Chaudhuri, Post Office Dwara Bazar, Sunamganj.
27. *Maulvi Syed Abdul Majid, Sylhet.

Goalpara.

28. Babu Dijes Chandra Chakravarti, Manager, Gauripur Estate, Goalpara.

Kamrup.

29. Rai Saheb Chidananda Chaudhuri, Gauhati.
30. Babu Mahendra Mohan Lahiri, Gauhati.
31. Munshi Tayab Ali, Beltola, Kamrup.

Darrang.

32. Babu Syama Charan Mitra, Tezpur.

Sibsagar.

33. *Babu Akshay Kumar Ghose, Sibsagar.
34. *Srijut Deleswar Gossain, Barpathar Sugarcane Farm (Golaghat), Badlipar Post Office.
35. D. S. Withers, Esq., Dessai and Parbuttia Tea Co., Ld., Moriani, Sibsagar.

NOTE.—The names of the Agricultural Associates have been marked with asterisks.

APPENDIX III.

Receipts and Expenditure of the Department of Agriculture for the year 1907-1908.

Receipts.	Amounts.	Expenditure.	Amounts.
1	2	3	4
	Rs. a. p.	*Experimental cultivation.*	Rs. a. p.
		Superintendence	71,047 9 4
		Expert staff—	
		Fibre Expert	16,861 9 4
		Agricultural Chemist	3,932 11 10
		Experimental Farms—	
		Dacca Farm	17,417 15 0
		Rangpur „	20,930 12 2
		Rajshahi „	9,487 15 0
		Jorhat „	13,351 11 1
		Upper Shillong Farm and Fruit Garden ...	9,440 5 5
		Wahjain Tropical Plantation	1,899 14 8
By sale of farm produce and manures	4,725 11 2	Total Experimental Farms ...	72,528 9 4
		Agricultural demonstrations and improvements—	
		Establishment for the revival of silk industry in Rajshahi.	524 6 6
By sale of silk	433 0 0	Sericultural School at Rajshahi	4,716 9 5
		Other agricultural demonstrations and experiments—	
		To cost of seed, manures and implements distributed.	5,122 4 0
By seed-potatoes	623 6 3	To cost of investigation of heart-damage in jute	1,698 5 0
		To demonstration of improved methods of handloom weaving.	1,058 14 0
		Contribution to agricultural and horticultural exhibitions.	4,923 14 0
By recoveries on sale of building materials used in public exhibitions.	73 13 9	Miscellaneous (including scholarships and travelling allowances to students sent to the Agri cultural College, Poona).	1,814 0 0
		Total other agricultural demonstrations and experiments.	14,617 5 0
Other receipts	1,180 3 3	To registration of Riverborne trade ...	4,138 0 4
		To Registration of Railway Traffic ...	360 0 0
		To provincial statistics—	
		Frontier Road-borne Traffic	744 0 0
		Internal ditto	803 14 0
		Raingauge establishments	112 1 11
Total Receipts	7,036 2 5	Total Expenditure ...	1,90,386 13 0

APPENDIX IV.

NOTE ON AGRICULTURAL EDUCATION BY H. SHARP, Esq., M.A., DIRECTOR OF PUBLIC INSTRUCTION, EASTERN BENGAL AND ASSAM.

The scheme of Agricultural Education as it was in existence in Bengal.

In order that the subject may be fully understood, it is necessary that we should first of all pass in brief review the history of the scheme from its initiation down to the time when the matter was taken up in this Province. The scheme originated at the Simla Conference of 1901, where great stress was laid on the necessity of Agricultural Education for the various classes of the community in India. The Director of Public Instruction, Bengal, laid before the Government certain schemes which aimed at imparting simple agricultural instruction to Primary and Middle schools, and some knowledge of the Science of Agriculture in High schools. As a result of these proposals it was decided that Secondary schools should be provided with gardens where possible so that proper instruction might be given in simple facts relating to Agriculture, and that "Agricultural Classes, where a specialised course of instruction might be imparted, were to be opened in connection with certain selected High schools." In accordance with this scheme, gardens were provided in connection with Comilla, Noakhali and Malda Zilla Schools, and an Agricultural class was opened in connection with the Chittagong High School. The scheme was started experimentally for five years, and as the period of experiment expired in 1907 the matter was taken up for consideration.

Results of the experiment.

The results of the experiment were far from satisfactory. The Agricultural classes at Chittagong were unpopular, because the subject did not form a part of the curriculum of studies of a High school. The experimental garden at Noakhali had a small measure of success, because it concerned itself mainly with the growing of vegetables, the immediate utility of which was apparent. That at Malda proved an utter failure, because the plot selected for a garden was far removed from the school. At Comilla, the scheme, though sanctioned, remained long in abeyance, until I visited the school early in 1906. The garden there is now useful for ornamental purposes, and for illustrating Science lessons, but no more.

Proposal for improvement.

The following revised proposals were submitted for the consideration of Government:—

(i) That gardens should be started, and gardeners maintained in High and Middle English schools for the sake of ornament, and for the cultivation of the aesthetic faculties of pupils.

(ii) That two training classes under the Department of Agriculture should be established, as an experimental measure, to train pupils for three months.

(iii) That all Head Pandits of Guru Training schools in Eastern Bengal should be made to undergo a short course in the training classes to be established.

These proposals were discussed at a conference at which the Director of Public Instruction, the Director of Agriculture and the Special Officer on duty in the Secretariat were present. The following scheme, to which the Local Government has given its assent, has been formulated:—

Government schools.

(I) In large secondary schools, separate gardens may be started, but in others what is required is to keep the compounds neat and tidy, beautified by some flowers and plants in beds or in pots. A small initial outlay is necessary, but afterwards a mere supply of seed and payment of an extra allowance of Rs. 2 to the durwan will suffice.

Aided schools.

Aided schools should be encouraged to keep the school compound in good order. Small initial and recurring grants may be sanctioned, provided an equal sum is forthcoming from private sources.

Vegetable gardens.

Seeds may be supplied to the gardens attached to hostels, where there are any, and a prize may be offered to the best vegetable plot in each division.

(II) A serious attempt should be made to impart agricultural instruction in primary schools. For this purpose the Conference decided that a curriculum for rural primary schools should be framed in which due importance should be given to agricultural subjects, that the Head Masters of Guru Training Schools should be trained under arrangements to be made by the Department of Agriculture, and that gardens in connection with Primary schools — Class I Lower Primary schools in Eastern Bengal and Board schools in Assam may be started.

(III) The question of the cultivation of fruit trees may be considered in connection with Primary schools alone.

Progress that has been made up to date in the scheme in its various points.

As regards Government Secondary schools, Inspectors have been asked to report what they have done with the annual fund for the improvement of the school compound. If the funds at the disposal of the Inspector are insufficient, it is proposed to move Government early next year for more money, so that effect may be given to the scheme. For the present year no action is needed.

Aided Secondary schools have been offered grants for improving the compounds through the Inspectors. All the replies have not yet come in. On receipt of replies, Government will be moved for sanction to the grant-in-aid that may be required.

Steps are being taken to supply vegetable seeds to hostels attached to Government High schools and a prize of Rs. 20 has been offered for the best vegetable plot in each division.

Inspectors have been asked to start gardens in Guru Training schools where possible and to make known the places where this can be done, and their wants. Seeds have been supplied to Guru Training schools. Government will be moved for sanction to Rs. 3 for half-time labourers.

Chairmen of District Boards have been asked to spend a small sum out of the Imperial grant for this year, to be spent in fencing compounds of Primary schools, and steps are being taken to supply seeds.

As regards Primary schools, seeds were supplied in 1906 and 1907, and are again being supplied this year, to Board schools in Assam. Schools of this class in Eastern Bengal districts are aided, and often have no building or compound of their own. But an improved type of Primary school, under the control of the District Boards, is being started in Eastern Bengal districts, and figures are being collected to show how many of these possess compounds capable of containing a garden. Primary Readers with full nature-study lessons are being introduced into Assam schools. And I am about to take up the question of remodelling the vernacular curriculum in Eastern Bengal districts.

Conclusion.

What has been attempted with regard to Secondary schools will suffice for the present. But the crux of the problem lies in giving effect to that part of the scheme that relates to Primary and Guru Training schools. What is wanted is a competent instructor for the training classes. Proposals have been made by the Department of Agriculture for the training of a suitable man to be the Superintendent of the classes. If this is accomplished the experiment is likely to be successful.

E. B. & A. S. P. O. (Agri.) No. 125—550—23-2-1909—T. E. J.

RESOLUTION ON THE REPORT OF THE AGRICULTURAL DEPARTMENT, EASTERN BENGAL AND ASSAM, FOR 1907-1908.

Extract from the Proceedings of the Lieutenant-Governor of Eastern Bengal and Assam in the Revenue Department, No. 931R., dated the 13th April 1909.

READ :—

The Report of the Department of Agriculture for the year 1907-1908.

RESOLUTION.

THERE has been great delay in the submission of this report, which was not sent up to Government even in manuscript until the 1st January 1909, although it was due in September last. This delay has not been adequately explained, and the Lieutenant-Governor trusts that careful arrangements are being made by the Director to secure that his next annual report shall be submitted more punctually. Such a delay as that which has occurred in the present case seriously impairs the interest and the value of the contents of the report.

2. The record which has been submitted by Mr. Hart of the work of the Agricultural Department for the year 1907-1908 is full of information and serves to demonstrate what a vast field of labour lies before this newly-constituted department, and how essential it was to separate it from the Department of Land Records, and to make the various additions to its staff that have been recently effected. The work of the Director is increasing daily, and new problems and new opportunities of usefulness present themselves so constantly that it is difficult to say what limits can be placed to the profitable development of the operations of the Department. But the organization of that work is still only commencing, and it is hampered not only by the imperative necessity for economy, but by the want of an agency for the carrying out of the reforms and schemes that lay claim to its attention. Little work of a scientific nature can be done by the experts who have recently been appointed until the new laboratory at Dacca has been completed and accommodation has been provided for those experts in its vicinity. At present Mr. Finlow, the Fibre Expert, is still in residence at Pusa, to the inconvenience and detriment of his work in the province, while the Agricultural Chemist has no laboratory accommodation whatsoever. In the same way it must be some time before the Dacca farm can be brought into good working order and the important new tobacco farm at Rangpur is only now being opened out.

3. The report shows, however, that these difficulties, and the limitation of the work of the Department, have not precluded advances in many directions during the past year, and the officers of the Department have made up for the denial to them of opportunities for research by active investigation into the requirements of the province generally, and by most useful tours, during which they have acquired valuable information. The staff of the Department has been strengthened during the year by the appointment of Mr. Meggitt as Agricultural Chemist, Mr. Hector as Economic Botanist, and Mr. Birt as an Assistant for practical agricultural work. Mr. J. N. Chakrabatti, who has been educated in agriculture at the Sibpur College and the Cornell University in America, and Mr. M. N. Chakrabatti, who has passed through a course of sericulture at Tokio, have also joined the Department. These gentlemen constitute a most valuable addition to our small band of agricultural workers and they are already training assistants to help them in the various branches of the Department; but a large number of such assistants is required, and it will be some years before the supply will in any respect meet the large demand for their services. Mr. Hart is in the meanwhile doing his best to secure suitable recruits, and this Government has already sent some of these recruits for further instruction at the Poona Agricultural College and the Pusa Institute. This Government is greatly indebted to the Principals of these institutions for the assistance and advice which has been given by them with reference to the education of the students who have been sent to them, and with that assistance, and the prospect of further help from the Bengal Agricultural College, it is hoped that the Department may soon be in a better position to supervise adequately our agricultural stations and to inspect the demonstrations conducted by our Honorary Associates.

4. The policy that has been adopted by this Government of enlisting the services of private persons who are interested in agriculture as Honorary Correspondents of the Department has been fully justified by the experience of the past year. Mr. Hart reports that these Honorary Correspondents have given him the greatest help in all matters connected with the work of his Department. He obtains from them information regarding the condition and prospects of the crops and reports as to the outbreaks of insect and fungus pests, while they are already becoming invaluable intermediaries between the Department and the cultivator, both in affording information to the Director as to the needs of the cultivators, and in making known to the latter the improvements which are recommended by the Department in Agricultural practice. It will be time enough to form district or divisional Agricultural Associations when those Honorary Correspondents become sufficiently numerous to render joint action on their part desirable. When that time comes the Agricultural Department will probably be able to delegate to these Associations of honorary workers some portion of its duties of inspecting and fostering experiments and demonstrations, and opportunities will thus be afforded for a still further extension of the operations of the Department.

5. It is unnecessary to review in detail the work done on the agricultural stations which have been established by the Department. That work has been briefly summarised in the Director's Report, and separate reports have been published for each station, giving fuller details of the experiments and demonstrations conducted upon them. At Rajshahi the farm is concerned with the experimental cultivation of various crops, while the new farm at Rangpur specializes in tobacco cultivation, and the Jorhat farm is devoted to the cultivation of sugar-cane. Important experiments in potato culture are being conducted at Shillong, and separate experiments are being carried out in the cultivation of cotton and jute in various parts of the province. Mr. Finlow, the Fibre Expert, has submitted a valuable note on the work done by him during the past year, which is published as an appendix to the report. The action that has been taken to deal with the orange tree blight, which is spreading rapidly in the Khasi Hills, has as yet been only partially successful. This particular blight is being investigated by the Imperial Mycologist, and various remedies are being tried to check it, such as the isolation of diseased trees by trenches from those in the rest of the grove, and the grafting of oranges on various trees, of the citron class such as limes, lemons, and pomelos.

6. An interesting report has been submitted by the Deputy Collector who was placed on special duty in March 1907 for the purpose of enquiring into the possibility of improvement in the breeds of poultry produced in this province. The enquiry was limited to the districts of Noakhali and Chittagong, and much valuable information was obtained in spite of the obstruction which was offered to the enquiries by cultivators who suspected that the investigation was a preliminary to the imposition of some new tax. The matter is being taken up by Mr. Meggitt, the Agricultural Chemist, who takes special interest in the subject, and it is proposed to start measures in the neighbourhood of the farm at Dacca for the improvement of poultry on the lines suggested in the report, this site being chosen as being the only one where constant supervision can be secured for the work.

7. Some progress is being made in carrying out the sericultural policy which was initiated by the Bengal Silk Committee. This Government has now taken over separate charge of the operations in this province and have obtained the services of a sericultural expert to supervise the nurseries in the Rajshahi Division, and to carry out on extended lines the work inherited from Bengal. The first object of the operations is to provide an adequate supply of healthy seed cocoons, and the second object is to instruct the silk-worm rearers gradually in methods which will secure them from the ravages of the diseases to which silk-worms are especially liable. The experiments in rearing silk-worms at the Fruit Farm in Shillong have proved very successful, and there is some prospect of the Khasis taking to silk-worm rearing and of making it a profitable industry.

8. The Agricultural and Industrial Exhibition held at Jorhat has been fully described in the Agricultural Journal of India for July 1908. It was well organized and attained much success, while the experience gained at it will render the initiation of similar shows in other districts of the province an easier matter in future.

9. The Director of Agriculture has continued his labours for the encouragement and development of other industries connected with agriculture. Much effort has been expended to secure the introduction of improved hand-looms for weavers, and demonstrations of the work of such looms have been conducted by competent instructors in

different parts of the province. But this subject and all others connected with it will be dealt with more fully in connection with the Industrial Conference that has recently been held in Dacca, and it is to be hoped that much useful work which has engaged the attention of the Agricultural Department in recent years will be largely extended under proper supervision as the result of the deliberations of that Conference.

10. The subject of agricultural education has been much discussed in the course of the year, and it has been dealt with in the questions and speeches in the Provincial Legislative Council and has formed the basis of much correspondence and many articles in the press. An interesting note by Mr. Sharp, Director of Public Instruction, is appended to the present report, from which it will be seen that the whole subject bristles with difficulties, and that although a commencement has been made towards the necessary preliminary training of the teachers who are to guide nature studies in the primary schools, it must be some time before any great results can be obtained. The Lieutenant-Governor regrets to think that it is impossible to accelerate the pace in the introduction of this valuable reform without increasing the danger of hasty and ill-considered action, which would defeat the object which he has in view.

11. By a much-needed reform the Director of Agriculture has now been charged with the duty of advising District and Local Boards in all arboricultural operations, and orders have recently been received from the Government of India, which will place at the Director's disposal the services of a competent practical gardener, an expert in arboriculture, who will afford much-needed advice and assistance in dealing with the difficult question of roadside tree planting, and who will supervise the planting out of the public gardens in the new station of Dacca, and the proper utilisation of similar open spaces in other important centres in the province.

12. The thanks of the Lieutenant-Governor are due to Mr. Hart for the care and attention with which he has supervised the operations of the Agricultural Department during the past year, and for his interesting report. The work of the Department is increasing rapidly in importance, and Sir Lancelot Hare is confident that if it is conducted on the lines which have been indicated in the account given of the operations of 1907-1908, it will soon produce results of the utmost value in the development of the new province.

By order of the Lieutenant-Governor,

P. C. LYON,

Chief Secretary to the Government of Eastern Bengal and Assam.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, EASTERN BENGAL AND ASSAM,

FOR THE

year ending the 30th June 1909.

SHILLONG:

PRINTED AT THE EASTERN BENGAL AND ASSAM SECRETARIAT PRINTING OFFICE.

1909.

No. 8569G.

FROM

F. W. STRONG, Esq., I.C.S.,
OFFICIATING DIRECTOR OF AGRICULTURE, EASTERN BENGAL AND ASSAM,

To

THE CHIEF SECRETARY TO THE GOVERNMENT OF EASTERN BENGAL AND ASSAM.

Dated Shillong, the 8th October 1909.

SIR,

I have the honour to submit the following report on the operations of the Department of Agriculture for the year ending the 30th June 1909.

I have the honour to be,

Sir,

Your most obedient servant,

F. W. STRONG,

Officiating Director of Agriculture, Eastern Bengal and Assam.

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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR THE

year ending the 30th June 1909.

CHAPTER I.

GENERAL ADMINISTRATION.

Members of the staff.

1. The post of Director was held by Mr. S. G. Hart up to the 21st June 1909 and by Mr. J. E. Scott for the few remaining days of the year. Mr. Hart having gone on long leave, I took over charge from Mr. Scott on the 30th July. Mr. A. G. Birt officiated as Assistant Director almost throughout the year in place of Rai B. C. Basu, Bahadur, who went onfurlough from the 7th July 1908 and returned to duty after the close of the year. Messrs. R. S. Finlow and A. A. Meggitt continued to act as Fibre Expert and Agricultural Chemist, respectively. Mr. G. P. Hector, who had been working for sometime as Supernumerary Botanist at Pusa, has joined this Province as Economic Botanist since the close of the year. Mr. J. N. Chakrabarti, Agricultural Supervisor, on the completion of his training at Pusa, was placed in charge of the Dacca Central Agricultural Station with effect from the 11th March 1909. Babu Guru Charan Chaudhuri, Sub-Deputy Collector, was placed on special duty at the Headquarters office, with effect from the 3rd November 1908, to perform the duties of Personal Assistant to the Director, as successor to Babu Hiranya Kumar Das Gupta, Sub-Deputy Collector, who reverted to the general line on the 1st October 1908.

Proposals were submitted to Government during the year for the appointment of a second Deputy Director, and orders are being awaited.

During the year there were no changes in the subordinate staff of the Department except that Babu Binaram Das, an Overseer of the Dacca Farm, was promoted to the grade of Farm Superintendent and posted at Jorhat in place of Babu Rajeswar Das Gupta, who was appointed to be the Superintendent of the Seed Depôt at Dacca.

The arrangement which was made in the previous year with Mr. A. C. Ghose, Sericultural Superintendent, Bengal, for the training of Mr. M. M. Chakrabarti and the supervision of his work, terminated on the 19th October 1908. With effect from the 1st November 1908, Mr. Chakrabarti was confirmed in the appointment of Superintendent of Sericulture in this Province, and he has since held charge of sericultural operations in Rajshahi, Malda and Bogra.

Director.

2. Mr. Hart was on tour for 176 days and visited the districts of Dacca, Mymensingh, Faridpur, Chittagong, Tippera, Rajshahi, Pabna, Malda, Rangpur, Cachar and Sibsagar. All the Agricultural Stations, excepting the Tropical Plantation at Wahjain, were visited by him. He also inspected some veterinary dispensaries. He attended a meeting of the Provincial Agricultural Officers held at Rajshahi in January 1909, and also the annual meeting of the Board of Agriculture in India held at Nagpur in February 1909, in company with Messrs. Birt and Finlow. He attended as a member the Industrial Conference held at Dacca from 25th February to 3rd March 1909. In March 1909 he visited Calcutta and made arrangements for the training of District Board employés from this Province in Arboriculture at the Sibpur Royal Botanic Garden. On that occasion he paid a visit to the Veterinary College at Belgachia.

Assistant Director.

3. The Officiating Assistant Director of Agriculture was on tour for 234 days.

Most of his time was occupied in supervising the work of the Agricultural Experiment Stations of the province.

His headquarters were at Dacca. The other experiment stations were inspected as often as possible, but as the various farms are so widely scattered over the province it is practically impossible for one man to exercise sufficient supervision over all the farms to insure efficiency. I consider that it is necessary for an officer to inspect all the farms under his control at least once a month. The Officiating

Assistant Director inspected the Agricultural Stations at Rajshahi four times, Rangpur five times, Jorhat six times, Shillong Farm and Fruit Garden four times, and Wahjain twice. In addition to the above tours the Officiating Assistant Director of Agriculture attended a conference of the Farm Superintendents of the province at Rajshahi in January. He also visited the Factory of the Peninsular Tobacco Company at Monghyr to get information as to the type of tobacco required for cigarette manufacture. He visited Dibrugarh in the beginning of February to enquire into the cultivation of sugarcane in that district. From the 15th to 20th February he attended the Annual Conference of the Board of Agriculture at Nagpur. He visited Barpathar (Golaghat subdivision, Assam) in the beginning of May to enquire into the cultivation of sugarcane and the manufacture of sugar with the Hadi apparatus.

He also made a short tour in the Khasi Hills in June to inspect the potato demonstrations which were being carried out on cultivators' holdings.

Fibre Expert.

4. Mr. Finlow still has his headquarters at Pusa and will remove to Dacca as soon as the buildings are ready there. He continued in collaboration with Mr. Burkill, Reporter on Economic Products, the study of the races of jute commenced in the previous year with the object of investigating the possibility of improving the jute crop by raising and distributing improved seed. A definite stage has now been reached as far as the classification of races is concerned. The jute experiments started in Chittagong in 1908 were repeated during the present year under his supervision. Trials with jute were made again in other parts of India in connection with the scheme for the extension of jute cultivation to tracts where it is not at present grown on a commercial scale. The experimental cultivation of flax and of several other fibres, such as Sida, *Urena lobata*, etc., also received his attention. The prospects of flax cultivation in Behar are reported by him in very hopeful terms. Mr. Finlow is also engaged in a scientific investigation into the cause and possible prevention of "heart damage" which sometimes takes place to baled jute. Fuller details of Mr. Finlow's work will be found in Appendix 1.

Agricultural Chemist.

5. The laboratory on the Dacca Farm not being ready yet, Mr. Meggitt was unable to do much work in his own line during the year. He set up a small field Laboratory on the Jorhat Farm and did some analytical work with sugarcane during the cold weather. He spent 194 days on tour and visited the Rajshahi, Burirhat, Jorhat and Shillong Farms and certain important sugarcane-growing tracts in the Dibrugarh subdivision. He assisted in the drawing up of programmes of experimental stations and a scheme for poultry operations in this Province and in an enquiry concerning the milk and dairy industry generally in Shillong. Most of his time, while at Dacca, was spent in watching the erection and fitting up of the Laboratory and Experts' residences on the Central Farm.

Agricultural supervisor.

6. Mr. Chakrabarti while at Pusa visited the Nagpur Agricultural and Industrial Exhibition and some of the Central Provinces and Bombay Farms during his winter vacation. He also visited the Peninsular Tobacco Company at Monghyr in company with Mr. Birt. Before taking over charge of the Dacca Farm he assisted the Farm Superintendent in the curing of tobacco at the Burirhat Farm.

Farm Superintendents.

7. On the whole, the work of the Farm Superintendents has been good, but I should like to see a little more care taken by some of them in carrying out experiments. Babu Kali Das Roy has done good work during the year in surveying and building on the Dacca Farm, and Mr. Herrick Singh, Superintendent, Shillong Experiment Station, showed great ability in organising demonstrations amongst the Khasias. The Superintendent of the Seed Depôt, Babu Rajeswar Das Gupta, has also worked well; in addition to his duties as Seed Depôt Superintendent, he was in charge of the planting of avenues at Dacca and also gave valuable help at the Shillong Flower Show and the Comilla Exhibition.

Entomological and Mycological Collectors.

8. Babu P. C. Sen, who was under training in Entomology at Pusa, has joined his duties as Entomological Collector at Dacca since the close of the year. On the recommendation of the Imperial Mycologist, it is proposed to extend the period of training of the young man, who was sent last year for a year's course in Mycology at Pusa by six months He is expected to take up his duties by the beginning of March next.

Honorary correspondents and Associates.

9. The Honorary correspondents supply information to the Department, and act as the channel of communication between it and the raiyats in their neighbourhood. The Associates, who are corespondents as well, are individuals of sufficient practical knowledge and public spirit to be entrusted with the carrying out of demonstrations of improvements which the Department desires to introduce. The system of working through these two classes of voluntary assistants was introduced in 1907-1908 and is being since gradually developed. They have proved very useful to the Department in obtaining information regarding the condition of standing crops. But so far as demonstrations of Agricultural improvements are concerned, very little could be done during the year for want of a staff to supervise them. A list of the Honorary correspondents is appended to this report (Appendix II).

Agricultural Association.

10. Among the District and Divisional Agricultural Associations established in Eastern Bengal before its annexation to this Province only two are now in existence, namely, those in Bogra and Rangpur. The Bogra Association held only one meeting during the year; some of the members have undertaken to make experiments in the present year with new varieties of crops, such as Samudrabali rice, Dacca Ganderi cane and Nainital potato. An effort will also be made to introduce the practice of green manuring in the Jaipur Khas Mehal. It was also decided to try Pandit Matadin Sukul's system of making experimental well borings at several places in the district. The members of the Association tried a number of new crops during the year. An account of these will be found in Chapter III which deals with the progress made during the year in introducing improvements relating to the various staple crops of the Province. The Association contemplates holding an Agricultural and Industrial Exhibition at the headquarters of the district during the ensuing cold weather.

The Rangpur Farm which was established in 1905 and continued to be under the management of the Agricultural Department till 31st July 1908, was transferred to the Rangpur Agricultural Association on that date. The Local Government has agreed to pay half the gross working expenses of the Farm not exceeding Rs. 3,000 per annum, and has permitted the District Board to contribute on a diminishing scale of Rs. 3,000, Rs. 2,000 and Rs. 1,000, respectively, for the three years commencing with the 1st August 1908. The principal object of the Farm will be to demonstrate improved methods of cultivation and to help in popularising new and superior varieties of crops by the distribution of seed. The new crops grown on the farm during the year were Darjeeling and Nainital potatoes, several varieties of exotic tobacco Raipur and Jabalpur mustard, Jamaica, Cochin and Calicut ginger, wheat, barley and oats. The foreign varieties of potatoes, tobacco, mustard and ginger were cultivated side by side with the local varieties. With the exception of potatoes and oats which had been grown for some years on the farm, and from which more or less definite results had been obtained, the cultivation of the crops mentioned above was still in the experimental stage, and it can hardly be said that they were grown for the purpose of demonstration. The results obtained from the potato crops grown on the farm are reviewed in Chapter III of this report. The oats crop gave a satisfactory outturn, a plot which was manured with municipal sweepings having yielded about 21¼ maunds of grain to the acre. A very satisfactory yield was also obtained from Jamaica ginger, which gave an outturn of 140 maunds of rhizomes to the acre as against about 116 maunds obtained from the country variety. Wheat and barley gave poor yields, the latter having suffered greatly from rust. The results obtained from the cultivation of foreign varieties of tobacco and mustard were indecisive, but it is a fact worthy of note that an American variety of tobacco called Fleminger excelled every other variety including the local in respect of yield, having given an outturn of a little over 16 maunds of cured leaf to the acre. The experiment, however, was not designed to compare the merits of the several varieties of tobacco grown during the year, but was made with the object of finding out whether these varieties would yield leaf suitable for the manufacture of cigarettes. The association does not report whether the leaf grown during the year has been found suitable for the purpose. The cash receipts of the farm during the year ending with 31st July 1909 amounted to Rs. 932-10-6 and the expenditure during the same period to Rs. 6,197-5-11.

Buildings.

11. The work of the Expert staff has hitherto been greatly hampered by the delay in the completion of the laboratory building and officer's residences at Dacca. It is hoped that these will be ready for occupation early in the cold weather. The construction of quarters for subordinate officers has been undertaken departmentally and most of them have been completed.

Financial.

12 The receipts of the Department amounted to Rs. 9,160-3-1 during the year and the expenditure to Rs. 2,06,121-7-9 against Rs. 7,036 and Rs. 1,90,386-13-0, respectively, in the preceding year.

CHAPTER II.

AGRICULTURAL STATIONS.

13. A conference composed of all Agricultural Officers of the Department above and including the rank of Farm Superintendents was held at Rajshahi in January last. It is proposed to hold a similar conference annually at one of the farms with a view to the interchange of views amongst the officers of the Department on various matters pertaining to the experimental work of the farms and to matters of general agricultural interest.

Dacca.

14. Up to the middle of November there were only three pairs of work cattle on the farm, so the amount of cultivation was necessarily limited. In 1908 most of the land was leased out to raiyats, but in the spring of 1909, having purchased 17 more pairs of cattle, we took over the whole of the land ourselves and cultivation commenced in earnest. The highland areas are very poor and uneven and so have been laid out in large blocks which will be cropped uniformly. Two large blocks are now under *aus* paddy, while most of the other blocks have been sown with *dhaincha* for green manure. Last season's experiments with winter paddy included a manurial and a variety experiment, but it is too early to attempt to draw any conclusions from the experiments. These experiments are being repeated, and others on methods of spacing and planting paddy are being laid down this year.

Building of quarters for the farm staff and laboratory assistants was continued and two tanks were re-excavated.

A considerable area of jungle land was cleared and levelled and put under crops for the first time last spring.

Rajshahi.

15. An elaborate series of paddy experiments was planned for the low land, but these could not be carried out, as there was no water in the plots owing to the dry season. Experiments with sugarcane, jute and potatoes were carried through successfully. In the variety trials with sugarcane, the Dacca Ganderi variety did best again, while in the manuring experiment, 300 maunds of cowdung per acre was more profitable when used alone than when 24 maunds castor cake or 6 maunds superphosphate and 2 maunds saltpetre were added to it. Experiments with jute included a manurial experiment to contrast the effects of applications of cowdung *versus* castor cake and also a rotation experiment, the jute being rotated with potatoes and pulse. Potatoes were tried for the second time on this farm and gave an excellent crop without irrigation. Further details of these experiments are given in the annual report of the farm.

Burirhat (Rangpur).

16. This is a new farm, the establishment having removed there from Rangpur in the beginning of August and the work is necessarily only in its preliminary stages. During the *rabi* season about one-third of the land was cropped, while the rest of the land was broken up and prepared for cropping in the spring. The *rabi* crops include tobacco, oats, mustard and potatoes. Several varieties of indigenous and foreign varieties of tobacco were grown, but on the whole the crop did not do well owing partly to the dry season. The best results were obtained from ½ acre of Sumatra on a plot of land which had been green manured with cowpeas in the preceding rains. Oats and mustard gave excellent results. Potatoes were only fair, but would have done better with irrigation. The two newly broken up blocks of land have been sown with *aus* paddy and *dhaincha*, respectively. The *dhaincha* will be ploughed in for green manure. The area which was cropped in the *rabi* season has been sown with cowpeas for green manure.

Jorhat.

17. The only experimental crop on this station is sugarcane. An elaborate scheme of manurial experiments was laid down in the spring of 1908, but owing to the unevenness of the soil, the results are valueless. Until we have had more experience of the soil of this farm and can find fairly even plots of land, we have decided to abandon manurial experiments and confine our attention to the testing of varieties on fairly large plots. We are not prepared at present to recommend any particular variety of cane as the best for this district, as our experience up to the present has been that, although many of

the foreign varieties of cane are better yielders and contain a bigger percentage of sugar than the local varieties, yet they are much more susceptible to disease and the attacks of animals, than the local varieties.

Upper Shillong.

18. Potatoes are practically the only experimental crop. The experiments this year deal with manuring, spraying with Bordeaux Mixture as a preventive of disease, methods of planting, trials of varieties, etc. Two new varieties were imported from England and held their own amongst the varieties we already had. Full details of the experiments are given in the annual report of the Farm.

Cattle breeding is progressing. Inferior animals have been weeded out and sold, and we now propose to confine our attention to the breeding of Patna bulls for distribution, instead of experimenting with crosses as in the past. A small sheep breeding experiment has also been commenced. Some ewes of the local breed are being crossed with a Dhumba ram; the first cross bred lambs show a great improvement on the local breed.

Fruit Station.

19. The prospects of the English fruit trees cannot be said to be favourable. The early setting in of the monsoon prevents the trees from setting fruit. Strawberries, asparagus, sweet potatoes and rhubarb do remarkably well and their cultivation shows a considerable profit.

Wahjain.

20. Experiments with lemon-grass oil were continued, but the difficulty of finding a ready market for it still remains to be solved. Mr. Hart has promised while on leave in England to make enquiries about a market for this product. Amongst the fruit trees and spices planted there, cocoa, camphor, cinnamon, pineapples, sapota, litchi and mangoes are thriving. Natal oranges have proved a failure.

CHAPTER. III.

PROGRESS IN INTRODUCING AGRICULTURAL IMPROVEMENTS.

Supply of seeds, manures and implements.

21. As an outcome of the difficulties experienced in connection with the supply of seed, a seed store, on a small scale, was established on the Dacca Farm during the year. It was opened on the 13th November 1908. The depôt is now accommodated in a part of the Farm godown; it is proposed to construct a separate building for it as soon as funds will permit. During the 9 months from November 1908 to June 1909, some 450 maunds of seeds of various kinds, including 257 maunds of seed potatoes purchased by the Superintendent in Calcutta, besides a large quantity of cuttings of sugarcane and some manures, were distributed.

The expenditure of the depôt during the year amounted to Rs. 5,886-1-8, including Rs. 2,547-1-6 for establishment, and the receipts, derived from recoveries of the price of seeds supplied to Rs. 2,569-4-6.

Cotton.

22. Seven maunds of seed of *Buri* cotton were obtained from Bengal and distributed for cultivation during the season of 1908 to cultivators in the Chittagong Hill Tracts, the Lushai Hills, the hills bordering South Sylhet and Hill Tippera and in the neighbourhood of Lumding. The seed arrived very late in most places, and the result of cultivation was very disappointing everywhere except at Lumding where the local Mauzadar, a Mikir, is reported to have obtained a very good crop. It is not known how much cottor he actually obtained, but the fact that he sent in a large indent for a new supply of seed shows that he was pleased with the result. A fresh distribution of *Buri* cotton seed has been made this year.

The District Board of Pabna is reported to have grown Dharwar American cotton as an experiment and obtained an extremely good result, the yield having amounted to 18 maunds of seed cotton per acre.

Two small samples of cotton grown at Gopalganj in the Faridpur district were received from Mr. S. M. Bose for valuation. They were forwarded to Mr. G. A. Gammie, Imperial Cotton Specialist, who thought very well of the samples and remarked with regard to the better of the two samples that it appeared to be "spence" variety with a staple 1$\frac{1}{16}$" long, strong and uniform, but to have lost its heredity in respect

of softness and colour. He valued this sample at Rs. 425 per candy of 784 lbs. or nearly Rs. 44 per maund. It is hardly to be expected that any benefit will result from efforts at introducing cotton cultivation in a district like Faridpur which is generally too low-lying to suit this crop and where important staples like jute, rice and sugarcane are grown on an extensive scale.

Jute.

23. Mention was made in the last Annual Report of certain experiments in the cultivation of jute which were made in 1908 in the Chittagong district. These experiments were initiated by the Department under the orders of Government and intended to test the possibilities of jute cultivation in Chittagong where this important staple has not yet come to be grown on a field scale. Mr. Finlow assisted in the supervision of these experiments and visited them from time to time. In some places the crop yielded a poor outturn in consequence of the unsuitability of the soil, but in suitable soil and with adequate manuring, extremely good yields appear to have been obtained. In one place the yield ranged as high as 22 maunds per acre. The quality of the fibre turned out to be as good as could be desired. The experiment was repeated on a smaller scale in 1909 and was confined this time to growing the crop on winter rice land. The germination of the plot was good, but the crop was greatly damaged by cattle trespassing in the field and gave a poor outturn. Fuller details will be found in the report of the Fibre Expert, Mr. R. S. Finlow, printed as an appendix to this report.

The Collector of Bogra reports that some raiyats of village Fulbari in the Police Circle of Shariakandi used bonedust as an experimental measure in some jute fields and got a far better outturn of jute than usual. An enquiry will be made as to whether this experiment has led to the increased use of bone manure in the neighbourhood.

Potatoes.

24. With a view to stimulate the spread of potato cultivation a vernacular notice inviting applications for seed potatoes with a bulletin on the subject of potato cultivation was distributed in August 1908 throughout the province through local officers and Honorary Correspondents of the Department.

The Superintendent of the Dacca Seed Depôt and the Farm Superintendent, Rajshahi, were sent to Calcutta and Darjeeling to purchase Nainital and Darjeeling potatoes, respectively. About 250 maunds of Nainital and 170 maunds of Darjeeling seeds were purchased and supplied to the applicants either direct from Calcutta and Darjeeling or through the temporary depôts opened for the purpose at Jorhat, Rajshahi, Dacca and Rangpur. A very large number of persons, both official and non-official, were supplied, and there was scarcely any district in the province which was not represented on the list of recipients. The Inspectors of Schools in the Dacca, Chittagong, Assam Valley and Surma Valley Divisions distributed small quantities of seed potatoes through their Deputy Inspectors to the teachers of rural schools. The season proved too dry in the beginning for the potato crop, and in many cases the seed supplied by the Department suffered from defective germination and resulted in poor crops. But where the soil was suitable and the crop was cultivated and manured with care, it gave a fair to good yield. A large number of persons were supplied with seed potatoes in and near the town of Rajshahi. Many of them irrigated the crop and obtained satisfactory yields varying from 90 to 180 maunds per acre. An Indian gentleman at Rangpur is reported to have obtained about 300 maunds of potatoes to the acre, and a cultivator in the Pabna district who planted 28 seers of seed on one-twelfth of an acre of *Char* land, which had its fertility re-inforced by a heavy dose of cowdung, obtained 20 maunds of tubers—a yield equivalent to 240 maunds to the acre.

Six members of the Rangpur Agricultural Association used a number of plots on the Rangpur Farm for growing Darjeeling and Nainital potatoes side by side with the local *Silbilati* variety. They intended to demonstrate the superiority of the Darjeeling variety over the *Silbilati* and the value of green-manuring with *dhaincha* and ground nut and of rape cake and cowdung as manures for the potato crop. The crops grew well and gave satisfactory yields. But a critical examination of the results which have been reported by the Secretary of the Association shows the demonstrations to be almost devoid of any value. The soil of the farm appears to be so rich and at the same time so uneven as to exclude the hope of any reliable results being obtained from experiments or demonstrations of a comparative nature. Taking all the plots (14 in number) on which potatoes were planted, the yields would appear to have been as follows :—Darjeeling 172 maunds 10 seers from .94 acre, Nainital 63 maunds 25 seers from .81 acre and *Silbilati* 79 maunds from .78 acre. These yields work out

per acre to 183 maunds for Darjeeling, 78 maunds for Nainital and 102 maunds for *Silbilati*, and may be accepted as proving the superiority of the imported Darjeeling variety over the local *Silbilati*. The cause of the low yield from Nainital seed is not known. Both Nainital and Darjeeling potatoes grown at Rangpur were found to be affected by Brown-rot, the former apparently to a greater degree than the latter; and this fact may account for the low yield from the Nainital seed. The Nainital and Darjeeling potatoes grown on the farm fetched much higher prices than the *Silbilati*, the latter having been sold at 13 annas and 6 pies per maund against Re. 1-7-10 obtained for the Darjeeling, and Re. 1-15-6 for the Nainital. The local variety has, however, one great advantage over the hills varieties in that unlike the latter it is free from disease and keeps well through the rains.

In February 1909, 10 maunds of Nainital seed were supplied to Mr. Ballantine, Subdivisional Officer of Haflong, from Shillong. Mr. Ballantine was transferred shortly afterwards. The sowings were made in March and April. The plants came up well, but all the tubers were found to be spoiled by a species of red ants. The failure is attributed by Mr. Ballantine to the fact that the manure used was too fresh and the season of planting was also not the right one. The Subdivisional Officer proposes to repeat the experiment, and arrangement is being made to supply him with fresh seed. Haflong is said to be yet free from the prevalence of potato disease, and one of the objects in experimenting with potatoes in that locality is to find out whether potatoes grown there in the rains can be utilised for distribution as seed in the plains districts.

In the spring of 1908, this Department supplied Major Cole, I.A., Superintendent of the Lushai Hills, with 170 maunds of Nainital, Darjeeling and Epicure seed potatoes for experimental cultivation in his district. The result of the cultivation is reported to be sufficiently satisfactory to justify the continuance of the experiment. Altogether 134 maunds of seed potatoes were planted out and in spite of heavy rain in July and August 1908, which caused great damage in fields which had promised well in the beginning, a gross yield of 553 maunds was obtained. The Nainital variety seems to have done best.

One hundred and twenty maunds eleven seers of seed saved from last year's crop was sown during the summer of the present year, and the results on the whole were very satisfactory, the total yield of tubers having amounted to 1,191 maunds 10 seers or nearly ten fold the quantity of seed planted. The sowings were made in March and April and the crops gathered in during July and August. The Nainital variety is reported to have given the best result. Some of the yields were very remarkable. In one place 18 maunds 5 seers of seed gave an outturn of nearly 451 maunds of potatoes; in another 4 maunds of seed gave 59 maunds of tubers, while in a third place the crop which was grown on the site of an old cowhouse yielded 40 times the quantity of seed sown. Besides the seed saved from last year's crop, the Superintendent was supplied with 159 maunds of fresh seed potatoes for the summer crop of the present year. Out of this quantity, 108 maunds 37 seers of seed was actually planted. The seed having arrived late the sowings were made in many cases very late in the season. The crops sown late proved a failure, but in the Lungleh subdivision, where 50 maunds of the newly imported seed were sown, the crops were reported to be doing well. Major Cole tried Khasi potatoes and five new English varieties on the Government plantation at Hmuifang in the current season. The sowings were made in the latter part of April, and the crops harvested about the end of July. The yields which varied from 7 to 14 times the quantity of seed planted were on the whole very satisfactory and would have been still better if the sowings had been made earlier in the season.

Sugarcane.

25. An attempt is being made to introduce the Dacca Ganderi sugarcane in the Jaipur Khas Mahal in Bogra. Cuttings to the value of Rs. 500 were supplied by this Department during the year and distributed for cultivation among a number of tenants of the estate. For want of moisture in the soil, the germination of the cuttings was somewhat defective, but the plants which came up are reported to be thriving. This excellent variety of sugarcane is expected to prove well suited to the soil of the estate.

The Superintendent, Bijni Raj, Goalpara, and the Jail Superintendent, Gauhati, who were supplied with Ganderi cuttings, report that the crops grown therefrom are doing well.

Srijut Debeswar Gossain of Barpathar in the Sibsagar district has lately installed a set of Hadi's sugarmaking apparatus worked by steam power and started the manufacture of sugar on a fairly extensive scale. He is reported to have manufactured

480 maunds of sugar and obtained a profit of Rs. 3,030 therefrom during the year. Details of the cost of manufacture and of the income obtained are given in Appendix IV. These will be found very instructive by those who intend to engage in the manufacture of sugar by Hadi's method. The sugar made at Barpathar obtained very good price which varied according to quality from Rs. 11-3 to Rs. 13-8 per maund. In those parts of the province where such good prices can be obtained for sugar, the use of the Hadi apparatus is expected to pay well.

The Hadi apparatus which was purchased by the Department in the previous year was not worked during the year. It is proposed to work the apparatus in the coming season.

Srijut Deveswar Gossain, who is an Associate of the Department, made demonstration on his own farm with castor cake as a manure for sugarcane, but the crop was greatly damaged by redrot and want of rain and yielded a poor outturn. The demonstration failed, therefore, to give any conclusive result.

Rice.

26. An attempt made to introduce terraced rice cultivation at Mokokchang among the Ao Nagas has met with encouraging results. The yield of paddy from 8 acres of terraced land cultivated with rice last year amounted to 247¼ maunds. During the year about 3 more acres were terraced and laid out for irrigation at Mokokchang. Mr. Dundas purchased a pair of bullocks and the whole of the 11 or 12 acres of terraced land at Mokokchang were ploughed and harrowed by bullock power. This is the first instance on record that land in those hills has been cultivated by bullock power. The credit for this very important step is due entirely to Mr. Dundas. The success of the Mokokchang experiment has stimulated a number of Ao and Sema Nagas to go in for terraced cultivation. The Semas of Chisilimi have extended the area terraced under Government supervision in 1905.

A very good report has been received on wet rice cultivation in the Champai and North Vanlaiphai valleys in the Lushai Hills. A large number of new Lushai settlers have taken up lands specially at the former place. The cultivation in these two valleys is reported to have passed the experimental stage and promises to be permanently successful.

The yield of last year's crop is estimated to be about 10,000 maunds. Several kinds of rice were tried, among which the Manipuri variety did particularly well. It is expected that before long the local requirements of the garrison will be supplied from this source and that it will no longer be necessary to import Balam rice from Bakarganj, as the Manipuri rice is said to be practically as good. The irrigation channel in the Champhai Valley traced by Colonel Loch, which is some three miles long, was completed during the year.

In the Jaipur Khas Mahal in Bogra, an experiment to grow *aus* rice by transplanation, a practice known in many parts of Bengal, but apparently new to the locality in question, proved successful. A similar experiment in the same khas mahal with a form of early rice known as *Jali aus* is also reported to have met with complete success. An attempt made during the year to introduce Bakarganj Balam rice failed on account of drought.

Babu Baidyanath Sanyal of Bogra, an Agricultural Associate, is trying to introduce the practice of green manuring in some villages near the western border of the district and is reported to have already achieved a small measure of success.

The result of the cultivation of two maunds of fine balam rice seed from Bakarganj supplied to the Subdivisional Officer, Cox's Bazar, in March 1908, was unsuccessful owing to a mistake in the method of cultivation.

Srijut Deveswar Gossain, Associate of Barpathar (Sibsagar), obtained on a plot of $\frac{2}{15}$ths of an acre, manured with 20 seers of bonemeal and 4 seers of saltpetre, an increase in yield equivalent to 9 maunds 11¼ seers of paddy per acre over an equal but unmanured plot. The value of the increase almost balances the cost of manure.

Nineteen demonstrations are being made in the Khasi Hills with bonemeal and saltpetre as manure for wet land rice. The crops are now on the ground. The results which seem to be hopeful will be reported next year.

Insect pests are reported to have damaged rice crops in some parts of the province. No steps could however be taken by the department, as there was no Entomological officer on its staff during the year.

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Orange cultivation.

27. The investigation into the orange tree blight is being continued, but as yet no definite result has been obtained. An experiment was initiated in the preceding year with the object of testing whether the isolating of healthy trees from diseased ones by means of a trench is effective enough to arrest the spread of the disease through the ground; and another experiment was started to save trees already affected by mixing the soil round the roots with slaked lime. The results of these experiments are not yet known. It is reported that an effective prevention of the blight will be found in growing orange on the roots of hardier species of citrus which are believed to be immune to the disease. With this object, experiments in budding orange on various citrus stocks were started during the year under report at Wahjain.

An expert budder was brought from Nagpur. He remained at Wahjain about three weeks but none of his efforts to bud the Sylhet or Khasi orange were successful. Since then the work of budding has been continued by the staff of the plantation and some success has been attained. Up to date 200 buddings have been made, of which some 20 have succeeded, but it is hoped that when the staff of the plantation have had more practice and experience, the number of successes will be very much larger. The work will be continued throughout the coming year in order to find out the most suitable season for budding, as this has still to be ascertained in the Khasi Hills.

Major Cole has been distributing large numbers of orange trees from the Khasi Hills among the Lushais and many of the trees are reported to be doing well.

Other crops.

28. A number of crops new to the district are being tried during the current rains at Kohima. Among these three species of millet, namely, *marua*, Italian millet and U *Raishan*, of which seed obtained from the Khasi Hills, oats from Dumraon, jowar from Saran and maize from Jaunpur, are reported to be doing well. Four varieties of tobacco seed, namely, Bhengi, Havana, Connecticut seed leaf, and Pennsylvania, were supplied to the Superintendent, Lushai Hills, in June 1908. It is reported that of these, the Pennsylvania tobacco did very well and is much appreciated by the Lushais. Three pounds of seed have been saved from the year's crop and distributed for cultivation to nearly 100 villages.

An attempt is being made to introduce Mahua in Chittagong. For this purpose some seed was obtained from the Bengal Agricultural Department in the previous year and was planted in the Model Farm near Chittagong. Twelve trees are reported to be in thriving condition.

Spraying demonstrations.

29. Mention was made in the last Annual Report of the successful results obtained in 1908 from demonstrations made in the fields of a number of Khasia cultivators to show the value of spraying potatoes with Bordeaux Mixture as a preventive of disease and of bone-meal and saltpetre as manures for wet land rice. Similar demonstrations were made on a more extended scale during the year under report (season 1909). To carry out these demonstrations two Khasia youths, who had been trained on the Shillong Farm, were appointed as demonstrators in April last, and placed under the orders of the Superintendent of the Farm, U Herrick Singh, who organised the demonstrations and supervised them throughout.

Forty demonstrations in all were made in 24 villages with the spraying of potatoes with Bordeaux Mixture. In each place, two almost equal plots of potatoes were selected side by side, one of which was sprayed twice during the season and the other left unsprayed. A careful record was made of the exact area of each contrasted plot, the quantity of spraying mixture used, and the yield of potatoes from each plot. The size of the plots varied widely, but averaged about 1-20th of an acre. The rate at which the mixture was used averaged about 111½ gallons valued at Rs. 8-4 per acre. The yield of potatoes from the total sprayed area (1·94 acres) averaged 110 maunds 11 seers per acre, and that from the unsprayed area (2·01 acres) 80 maunds 38 seers. The excess of yield amounting to 29 maunds 13 seers would be valued at the lowest rate (Re. 1-4 per maund) at Rs. 36-12 which would leave a handsome profit after deducting the cost of the special treatment. In four places only, spraying failed to show any profit. A clear profit was obtained from each of the remaining thirty-six; and ranged from Rs. 12-8 to as high a figure as Rs. 214-8 per acre The success of the spraying demonstrations for two years' running has convinced many Khasia cultivators of the great utility of spraying potatoes with Bordeaux Mixture. A well-to-do Khasia cultivator has requested this Department to purchase a spraying pump for him, and several others who cannot afford to purchase pumps have

applied for the hire of machines from this Department. Every effort will be made to meet the wants of the people in this direction in the next season.

Budding and grafting.

30. The two Khasia demonstrators, besides assisting in the conduct of the demonstrations described above, have done much useful work in teaching the art of grafting to the villagers. Since April last, they have grafted about three hundred trees (mostly pears and peaches) in 46 Khasia gardens. Most of these are reported to have succeeded, but the exact results will not be known till after the close of the ensuing winter.

CHAPTER IV.

Operations for the improvement of Agricultural live-stock.

Poultry.

31. The scheme for the improvement of Poultry in the plains drawn up by Mr. A. A. Meggitt received the approval of Government in February last. It provides for initiating poultry breeding operations on a small scale on the Dacca Farm, where supervision and control can best be given.

The objects are :—

(1) To breed and distribute stock birds of approved breeds *viz.*, China Langshan or pure Chittagong, which are almost certain to effect an immediate improvement in the general type of *basti* fowl.

(2) To supply eggs for hatching of one or two selected pure breeds, and of the first crosses between them.

So far nothing has yet been done at Dacca, but steps are being taken to commence the work at an early date.

The rearing of good and hardy strains of poultry, for the purpose of distribution and improvement of local stock, has already attained considerable success in the Lushai Hills under the private management of the Superintendent, Major H. W. G. Cole, I.A. Several Lushai villages and hamlets have now only cocks raised from imported breeds. During the year a number of pure Chittagong cockerels and hens were obtained through the Subdivisional Officer, Cox's Bazar. There are now 9 pens and 5 other fowl houses. The total stock on the poultry farm is now 300, all being imported birds. Chittagong birds are reported to thrive best, but a cross between the pure Aseel Chittagong and the Buff Langshan promises very well. The present rate of production of eggs is from 300 to 500 per mensem and the greater part of these are sold to Lushais. The demand for eggs is in excess of the supply. Since 1st February 1909, 2,955 eggs have been laid, of which 1,809 have been sold or exchanged to Lushais and the balance set or given for unfertile eggs. The farm was taken over by Government on the 1st July 1908, and all expenditure in this connection is now borne by this Department. The total expenditure during the year amounted to Rs. 2,699-14-1 and the receipts to Rs. 219-11-0.

Poultry breeding on a small scale was undertaken by Mr. R. A. Stephen, Subdivisional Officer, Cox's Bazar, but the results were not satisfactory, as disease broke out among the fowls and caused many deaths.

With the approval of Government, a poultry breeding experiment on a small scale was started last year at the Shillong Fruit Garden. Two pens of China Langshan and Chittagong fowls, each consisting of one cock and eight hens were procured. There was much disease among the fowls, and it is probable the climate did not suit them in the beginning. As many as 5 China and 2 Chittagong hens as well as 13 Chittagong chickens died from diseases of different kinds. The China cock has proved to be sterile with the result that the eggs laid by the hens with which he mated failed to hatch. Fifty-one eggs were sold to neighbouring villagers at 2 annas each ; out of these twenty-seven were from China fowls and failed to hatch for the reason already stated. The remaining twenty-one were the produce of the Chittagong hens and are reported to have hatched all right. The total cost of the experiment has amounted to about Rs. 616, which includes Rs. 423 spent on the construction of two moveable fowl-houses, Rs. 42 as price of the birds, and Rs. 60 spent as wages of a keeper. The only receipts amounted to Rs. 6-6 and were derived from the sale of eggs for breeding. The experiment so far has given no promise of success. I propose to address Government shortly with reference to the lines on which poultry breeding experiments should be carried on in future. My

intention is to concentrate all work in this direction at least for the next year or two on the Dacca Farm.

Many enquiries were received during the year regarding the improvement of poultry in this province. It is proposed to publish shortly as a bulletin a brief abstract of the Report of Babu Ambica Charan Dutt on the poultry-breeding industry in Noakhali and Chittagong with supplementary notes by Mr. Meggitt.

CHAPTER V.

Sericultural operations.

Operations in the Rajshahi Division.

32. During the year all Financial and administrative control of the sericultural operations in Malda, Rajshahi and Bogra was transferred from the Bengal Silk Committee to this Department, and Mr. M. M. Chakrabarti was placed in charge of these operations. The chief object of Mr. Chakrabarti's work will be to produce and sell on business lines the largest possible quantity of guaranteed seed.

A suitable site for a central grainerie has been selected at Mirganj which is the centre of one of the principal *Jowars* in the Rajshahi district, and Mr. Chakrabarti was engaged during the year principally on the work of planting the land with mulberry and the construction of rearing houses. These works are expected to be finished in the course of the ensuing cold weather, when the work of rearing will be commenced.

The nurseries at Banesvar and Kharkhari continued to distribute selected seed to the rearers, but no definite information is available as to the quality of the seed or as to the opinion in which seed from these nurseries is held by the native rearers. The total expenditure at the two nurseries amounted during the year to Rs. 751-8, and the total receipts from the sale of cocoons to Rs. 815-6, leaving a net profit of Rs. 63-14. So far the operations may be regarded as successful.

We inherited from the Bengal Silk Committee a staff of two Sub-Overseers and two Sericultural Overseers in Malda. The duties of the Sub-Overseers are to instruct the rearers and to advise them in the purchase of seed cocoons. The teachers conduct classes in two Middle Vernacular Schools situated in two important silk-rearing centres (Jote-Arapur and Sujapur). Mr. Chakrabarti inspected the work of the Sub-Overseers and teachers in December last and has expressed strong doubts as to whether they are doing any good. The question of retaining their services and on the lines on which they should work is now under consideration in consultation with the Chairman of the Malda District Board. The Bogra District Board also employs two Sub-Overseers, whose duties are similar to those in Malda, but no information has been received as to their work during the year.

Mr. Chakrabarti's report is printed as Appendix V to this report.

Rajshahi Sericultural School.

33. The main object of the institution is the training of the sons of actual silkworm rearers in the theory and practice of silkworm culture. The school course extends over one year and twelve apprentices with stipends of Rs. 5 each are appointed annually. In 1908, the class opened on the 1st February when altogether 18 students joined, but after resignations and elimination on the result of the half-yearly examination, eight finally remained on the roll. At the annual examination held in January 1909, 5 out of 8 who sat for the examination came out successful. Of these five, one was a Khasia boy from Shillong and another came from the Dhenkanal State, Orissa. The remaining three students were each awarded a microscope and a money grant of Rs. 250 to enable them to build a rearing house on approved lines. A similar grant of money and microscope will be made to the Khasia boy as soon as his mulberry plantation is sufficiently advanced to permit rearing operation to be taken up.

Of the seven successful students of 1907, who each received an advance of Rs. 250 for building a rearing house, only one man is known to have completed the house. Three others are said to have built rearing houses, but the completion reports of these men have not yet been verified. Two others have reported that the materials they collected for the purpose were destroyed by fire.

The Sericultural Superintendent is enquiring into these cases. One student has refunded part of the grant made to him. To ensure a proper use of the grant of Rs. 250 it is perhaps desirable that the amount instead of being paid in

lump be given out in instalments according to the progress of the house from time to time. I shall take up this question shortly.

The class opened this year on 1st January, when altogether twelve students were admitted, two of whom have since left.

The school plantation consists of about 15 bighas of mulberry land. The Secretary of the School reports that by repeated selection at the School nursery *deshi* silk-worms have been reared in the school perfectly free from *pebrine* and the seed cocoons sold by the school are gaining favour among the village rearers of the district. The Secretary also mentions it as a note-worthy fact that rearers from the Malda district took seed from the school during the year.

There has been some difficulty about securing a competent Head Master for the school. The temporary arrangement made now will continue till a suitable man is found.

The total receipts of the school including sale proceeds of cocoons amounted to Rs. 254-15-6 during the year under report against Rs. 671-12-6 in 1907-1908, and the total expenditure to Rs. 4,354-4-2 against Rs. 5,067-15-5 in the previous year. I am enquiring into the cause of the shortage of the receipts.

Operations in the Khasi Hills.

34. The experiment in the rearing of the European Univoltine silkworm was repeated for the sixth time at the Shillong Fruit Garden last spring and proved as successful as in previous years. A detailed report of the experiments will be found in the Annual Report of the Fruit Garden published separately.

With a view to introduce sericulture in the Khasi Hills, one of the steps taken by the Department is to have a number of Khasi youths trained at Government expenses at the Rajshahi Sericultural School. One student sent for training in 1908 returned to Shillong early in 1909, and it was under his management that the silkworm crop of 1909 at the Fruit Garden was raised. As one of the conditions of the agreement into which he entered with the Department at the time of his deputation to the Sericultural School he has started a mulberry plantation in his own village at Kynshi near Mairang in the Khasi Hills. The growth of his trees has been much retarded by frosts, and it is not expected that he will be able to commence rearing in his village before the spring of 1911. The money grant of Rs. 250 which he earned on passing the final examination of the school has not been paid to him yet. A second Khasi boy was sent for training to Rajshahi in January 1909. It is proposed to offer two stipends for 1910, but up-to-date only one candidate has come forward.

CHAPTER VI.

Development of other Industries connected with Agriculture.

Hand-loom weaving.

35. The whole question of the introduction of improvements in hand-loom weaving was discussed at the Industrial Conference held at Dacca early in 1909 by a sub-commitee presided over by Mr. Hart, and the recommendations made by the Conference as to the establishment of hand-loom factories and other suggestions for organizing the hand-loom industry are still under the consideration of Government.

Early last year, the authorities of the Salvation Army deputed one of their European Factory staff together with a Tamil weaver instructor to this province for the purpose of popularizing the use of their "Automatic Triumph" loom. They visited a number of important weaving centres, but owing to the shortness of their stay, their unfamiliarity with the vernacular of the province and other causes, they failed to create any permanent impression at the time.

Following the scheme settled last year, Commissioner Booth Tucker of the Salvation Army was approached again with a request for the services of some reliable instructors, but as he could not arrange for a suitable officer to supervise the work of the instructors, nothing more could be done during the year. The Industrial Conference was of opinion that the Salvation Army loom is too heavy and too high to be suitable for women; for the present or until a lighter loom has been devised, the instruction of females in Assam, which formed a part of the scheme, has been abandoned.

An expert weaver from Dacca was sent to Bombay and other places at the expense of the Dacca District Board to learn the use of improved looms and how to fit and repair the Salvation Army hand-loom and to warp and size the thread.

Towards the close of the year the sanction of Government was received to the proposal of this Department to depute him at Government expense to Ludhiana for one month in order to acquire a thorough training in the working of the Salvation Army loom; but from a recent communication from the Collector, it appears that the stipend sanctioned for him is not sufficient to induce him to go for training to Ludhiana. The matter is under consideration.

It is reported from the Surma Valley that the weaving industry which was almost extinct is reviving gradually owing to the increased demand for *deshi* cloth. The peripatetic weaving instructor who is employed by the North Sylhet Local Board trained 31 pupils in different villages in the use of the fly-shuttle hand-loom during the last cold weather. The instruction is said to have evoked enthusiasm among people of the weaver class (Jugis) and 9 fly-shuttle looms have been set up by them at their own cost.

Some gentlemen in Pabna are reported to have imported eight improved hand-looms from Serampur and distributed them to their weaver tenants.

Spinning machine.

36. A Mahommedan *Mistri* of Silchar, who has invented an ingenious spinning machine, but has not been able to perfect it for want of appliances and sufficient technical knowledge, has been awarded a stipend of Rs. 25 per month for a year by the Silchar Local Board and sent for training to the Steamer Company's workshop at Fenchuganj.

CHAPTER VII.

Agricultural Education.

Agricultural training in public schools.

37. Little progress has been made with the scheme for imparting agricultural instruction in Primary Schools. The Government of India have ruled that definite agricultural instruction is to form no part of the curriculum of these schools, but what is wanted is that the boys should be encouraged to study plant life. For this purpose it would be necessary to have a small garden attached to each Primary School. The garden would be used not to impart definite agricultural teaching but simply to illustrate the various phenomena of plant life. With this end in view, the Director of Public Instruction is endeavouring to obtain sites for gardens in connection with Board Primary Schools in Eastern Bengal, and a number of gardens have been or will be shortly provided for Guru Training Schools in that part of the province. This Department is charged under the scheme with the duty of training Headmasters of Guru Training Schools in methods of nature-study. As a preliminary step, it is proposed to train a selected officer in the art of teaching nature-study. The Local Government is in correspondence with the Government of India in this subject, and it remains still to be decided as to the precise nature of training which the selected officer should have to undergo to fit him for the duties of the post.

Deputation of students to Poona Agricultural College.

38. During the year three students were selected for training at the Poona Agricultural College, but only two actually joined the College. Two out of the three students who were deputed to the Poona College in 1907 are reported to have made good progress in their studies. The third boy failed to pass the examination of the 2nd-year class, but has been allowed to continue his studies. The boy sent in 1908 is reported to have made very satisfactory progress during his first-year course. The Department is greatly indebted to Dr. H. Mann, Principal of the College, for the kindly interest he is taking in the welfare and progress of the students from this province.

Practical training of sons of cultivators.

39. Four apprentices were admitted during the year to the Dacca Farm on an allowance of Rs. 15 per mensem. They will undergo a course of two years' training in the best methods of cultivation, and when qualified, they will be appointed to conduct agricultural demonstrations on Government and Ward's Estates and to assist Agricultural Associates in making such demonstrations. Four new appointments will be made in the present year. Until the Dacca Farm has been sufficiently developed to train more men, it is not proposed to recruit more than four men annually. A proposal has been recently submitted to Government for employing one or two apprentices at each of the other Agricultural Stations.

Arrangements were made during the year to start classes in the Shillong Fruit Garden for training suitable youths from the village schools of the Khasi Hills in the grafting, budding and pruning of fruit trees, but none came forward to avail themselves of the opportunity.

Provincial Agricultural and Veterinary Colleges.

40. Arrangements made with the Government of Bengal for the training of students from this province in the Bengal Agricultural College at Bhagalpur and the Bengal Veterinary College at Belgachia still hold good. It is understood that the former institution will not be opened till 1911. A detailed note on the training of students at the Veterinary College will be found in the report of the Veterinary Department published separately.

CHAPTER VIII.

Exhibitions and Shows.

Shillong Show.

41. The sixth annual show of field and garden produce was held in Shillong on the 24th and 25th May 1909. As in last year the show was held on two days. The number of spectators on both days was fairly large. His Honour the Lieutenant-Governor was pleased to visit the show on both days and distribute prizes and certificates of merit awarded for the best exhibits. The exhibits included vegetables, orchids and other flowers, fruits, dairy produce, honey, poultry, cattle, horses, wild ferns and rare plants, fibre plants, etc. The show of vegetables this year both in the open class and in the class for Khasias was better than last year and the display of cut-flowers was, in the opinion of many people, the best ever seen at the Shillong Show. One hundred and thirty-four money prizes aggregating Rs. 359 were awarded.

An important feature of the show was the demonstration of various new agricultural implements and machines, such as, a Maize Crusher, a Maize Sheller, a Planat Junior hand-hoe and a spraying machine. These were shown at work on the Show ground and attracted a large number of Khasia cultivators. For the purpose of demonstrating the use of the Spraying machine, a small area of potatoes had been planted sometime beforehand on the Show ground and the method of Bordeaux Mixture and of spraying it on potatoes was shown and explained to the visitors. There was a note-worthy exhibit in the class for "bulls bred at the Government Farm which have been in the possession of a Khasia for two years." Mr. Harris, Superintendent, Civil Veterinary Department, reported on this animal which obtained the first prize in that class in the following terms:—

> "A very useful bull with a lot of Patna blood. He was in fair condition and had a lot of bone and good girth. He should be a valuable acquisition to his district. One of his progeny, an 18 month old calf, was also shown. This calf was a promising youngster and, if he is looked after, will be a great improvement on the ordinary class of hill stock."

Other Agricultural shows.

42. Agricultural shows were held during the year at Falakata (Jalpaiguri) and Comilla and a cattle show at Sylhet. The Falakata show was held in connection with the annual fair which is maintained mainly for the encouragement of trade between Bhutan and the plains. It came off early in 1909 and received a Government grant of Rs. 200. It attracted rather more Bhutias than usual, but they brought very little of their own produce for sale.

The Comilla Agricultural and Industrial Exhibition was held at the end of June last. Being held at an unsuitable season of the year, it failed to attract a sufficient number of agricultural exhibits. The most noteworthy exhibit in the agricultural section consisted of several samples of tapioca locally manufactured. Babu Anukul Chandra Roy, Manager of the Bhukailash Ward's estates, demonstrated the method of preparing tapioca on the show ground. The Agricultural Department deputed the Superintendent of the Central Seed Depôt, Dacca, to assist in the management of the show and sent a number of improved implements together with a collection of new crops grown on the Government Farms, manures and insecticides. The industrial section of the exhibition was well represented among the exhibits worthy of note, being cutmery from the technical schools at Comilla and Agartala, leather work from the Dacca Tanery, Mainamati cloths, steel boxes and trunks from Chittagong, and cigarettes manufactured by the newly-established tobacco factory at Rangpur.

Mr. W. Harris, Superintendent, Civil Veterinary Department, attended the Sylhet Cattle Show, which was held in January last, and helped the judging committee with his advice. Two hundred and thirty-eight head of cattle were exhibited and a sum of Rs. 380 was awarded as prizes by the North Sylhet Local Board under whose auspices the show was held.

CHAPTER IX.

COLLECTION AND SUPPLY OF INFORMATION.

Agricultural publications.

43. During the year the following bulletins and leaflets were published and distributed :—

Revised Bulletin No. 17—on some important insect pests of this province.

Leaflet No. 2 of 1908—how to water fruit trees.

Leaflet No. 3 of 1908—Central Seed Depôt.

Leaflet No. 1 of 1909—Ufra disease.

Of these, leaflet No. 2 only was published in Bengali and Assamese. A vernacular version of the revised edition of bulletin No. 17 is in course of preparation.

A year book in Bengali, explaining the aims and objects of the Department and reviewing its work for 1316 B.S. (1907-1908) has recently been published, and it is proposed to repeat the issue of a similar publication every year. It is proposed to circulate the year book free of cost to all rural schools and *panchayats* in the plains districts of Eastern Bengal and Assam.

Agricultural statistics, forecasts, etc.

44. The usual Preliminary and Final Forecasts of the various staple crops of the province as well as the Agricultural Statistics and the Season and Crop Report for 1907-1908 were prepared and published. The periodical reports on the state of the crops received from Honorary Correspondents proved very useful in checking the information furnished by District Officers. Proposals submitted to Government for recasting the crop forecasts and for modifying the statements in the Season and Crop Report are still under consideration. The usual reports on tea culture and a return on the production of coffee were issued during the year. The latter has since been discontinued under the orders of Government. A revised note on the weights and measures in general use in Eastern Bengal and Assam was also issued. A note on "Jute in rotation with paddy in the same year and its effect on food crops" issued during the previous year is under revision and will be shortly published.

The compilation of the weekly Weather and crop Reports and the monthly and annual rainfall returns was as usual done in my office.

Trade statistics.

45. The usual quarterly and annual statistics of the trade of the province carried by rail and river and the monthly and yearly returns of the trade with transfrontier tribes were issued from my office. An annual statement showing the import and export trade in selected articles of each district of the province with Calcutta, Chittagong, the rest of Eastern Bengal and Assam, and all other places was published for the first time during the year. The registration of the trade of Chittagong by rail, river, sea and road has commenced from the 1st February 1909. All Trade Registrars except those under the control of the Port Commissioners, Chittagong, have been transferred from the district staff to this Department with effect from the 1st April 1909, and an Inspector has been appointed for the purpose of supervising the work of the trade registration stations in the province.

Prices and wages.

46. Fortnightly returns of wholesale and retail prices-current were published as usual. Orders are being awaited on the scheme submitted to Government last year for modifying the present system of reporting wholesale prices.

Half-yearly returns showing the prevailing rates of wages in each district for agricultural and other labourers were also published. The scheme for taking a quinquennial wage census for this province is still under discussion.

CHAPTER X.

ARBORICULTURE.

Arboriculture.

47. During the year under report, I received instructions from Government to prepare a manual of arboriculture for this province and to supply District and Local Boards with model working schemes for roadside planting and to arrange for the training of District Board employes in arboriculture. I was also assigned the duties of inspecting and advising upon all arboricultural operations in the province. Arrangements have been completed with the Superintendent, Royal Botanic Garden at Sibpur, to train men from this province and 18 officers have been selected by District and Local Boards for training in the present year.

Many new additions were made to the nursery for ornamental shrubs and plants at Shillong. Plants are supplied for road sides and other public places, and the surplus is at present distributed gratis for the improvement of private compounds. During the year 838 plants were distributed to 163 persons in the station. The planting of avenues and clumps of trees in the new civil station of Dacca continued to be in charge of this Department and the work was supervised by the Superintendent, Central Seed Depôt, Dacca. Fair progress was made in the planting of avenues and preparations were made for laying out compounds.

Since the close of the year, the services of an Arboricultural Expert, Mr. R. L Proudlock, Curator of the Botanical Gardens at Ootacamund, Madras, have been temporarily obtained and placed under this Department. He joined this province on the 6th July and is now employed in the laying out of avenues, public gardens and compounds in the civil station of Dacca.

APPENDIX I.

REPORT ON THE WORK DONE BY THE FIBRE EXPERT.

Experiments with jute at Pusa.

The study of the races of jute, outlined in previous reports, has been continued, during the past year, in collaboration, as before, with Mr. Burkill, the Reporter on Economic Products to the Government of India; and a final stage has now been reached as far as classification is concerned. Hitherto we had arranged the hundred races, with which we commenced, under about 33 heads, but the work of the period under review has enabled us to reduce the number to less than twenty, including two new races kindly sent from Formosa by Mr. Ando of the Imperial Japanese Agricultural Department.

We have now, as a basis for future work, about 15 types, which appear to be quite fixed, as far as the cultural characteristics with which we have been dealing are concerned.

The field work has throughout been carried on in conjunction with observations in the laboratory. The latter work, which becomes increasingly important as the investigation proceeds, involves a laborious chemical and microscopic examination of the respective fibres produced from the various types of plants. While showing a great general similarity between these types it has indicated differences which, though only small, would, if permanent, point to the possibility of producing an improved type by direct plant-to-plant selection. This is one of the lines on which work is now proceeding. Another is the production of hybrid races by cross breeding between two pure types. Preliminary experiments in this direction were commenced last year and the first generation of hybrid plants is now maturing. As evidence is accumulating that the jute flower is normally self fertilized the investigation of the effect of hybridization becomes more important.

Jute experiments in the Chittagong district.

These experiments were commenced in 1908 at the instance of the Hon'ble Mr. Luson, Commissioner of Chittagong, and of the Director of Agriculture (Mr. Hart), with the object (*a*) of investigating the possibilities of the Chittagong district for the purpose of jute cultivation, and (*b*) in the event of the experiments made being successful, of trying to induce the cultivators to grow jute as a kharif crop, in rotation with winter paddy, on lands which at present bear only one paddy crop in the year. Such a practice, as the soil is usually heavy and sets hard on drying, involves the ploughing and preparation of the land immediately after the paddy crop is taken off in December. The first year's experiments had therefore to be largely confined to higher lands from which crops were obtained as follows:—

Nischintapur	at the rate of	nearly 22	maunds	per acre.
Rajanager	"	"	20	"
Dohazari (manured plot)	"	"	12½	"

The Dohazari plot was damaged by crickets and had to be resown, which accounts, to some extent, for the small yield.

The results show that the high lands are capable of yielding excellent crops; but, as such lands usually bear a kharif food crop, it is not considered advisable to attempt to replace this with jute.

As was expected, the time of sowing was too late for the lower lands, on which the crops were a failure.

During the present season, it was decided to carry out the experiments only on winter paddy land and, in view of the lack of a sufficient supervising staff, to confine them to one place, *viz.*, Rajanager, on the estate of Kumar Romoni Mohon Roy, brother of the Chakma Chief, to whom I wish to express my indebtedness, not only for the interest he has taken in the work; but also for the practical help he has given.

The result of this experiment is indefinite as regards the jute, about one-third of which was unfortunately damaged by stampeding cattle, which broke down the fencing of the plot. The yield of fibre, which is of very good quality, was thus only at the rate of nine maunds per acre, a return which would undoubtedly have been considerably greater but for the unfortunate accident. The jute was ready to be cut in ample time for the paddy to be transplanted, thus showing that it need not interfere with the food crop which is ordinarily produced on such land.

The experiment is well worth repeating next season when more definite results will, it is hoped, be obtained.

It should be noted that these experiments have another object in view than the immediate one of introducing jute cultivation into the Chittagong district. It is hoped that they will be a means of bringing the Department to the notice of both the land-owners and cultivators in the district and ultimately of inducing their co-operation in the advancement of agricultural practice. In this respect some small success may already be said to be achieved; although we are yet a long way from the desired end. The experiments are not conducted on land belonging to a Government farm, but on the raiyat's field with his own implements. When it was first sought to obtain land for this purpose, there was naturally a good deal of suspicion amongst the cultivators regarding the object which Government had in view in taking such an entirely new departure. It is hardly necessary to state that the explanation offered at the time was not accepted; but it is satisfactory to note that the difficulty has now disappeared, a fact which indicates at least that the cultivator apprehends no evil to himself from the experiments.

It remains to be said that the principle of mutual confidence and of co-operation between the Department and the cultivators is one on which great stress was laid by a committee of the Board of Agriculture held at Nagpur in February 1909.

Jute experiments in other Provinces.

Trials with jute continue to be made with promising results at Nagpur and at Raipur in the Central Provinces, also at Belgaun in the Bombay Presidency. In Madras, however, owing to the high price of rice and the low price of jute, experiments have for the present been abandoned.

Investigation into the deterioration of baled jute.

In July 1907, the author in collaboration with Messrs. Cross and Bevan of London commenced an investigation into the deterioration, known as "heart damage" which sometimes takes place in baled jute, and a preliminary report on the subject has been presented to the Secretary of State for India by Messrs. Cross and Bevan.

The report commences with a technical description of the typical characteristics of "heart damage." It then goes on to discuss the condition on its arrival in London of jute treated and baled in India by the Fibre Expert to the Government of Eastern Bengal and Assam, and finally concludes with some recommendations for the further pursuance of the investigation.

The salient points of the report may be summed as follows :—

(*a*) The chief physical characteristic of typical heart damage in jute is an entire loss of tensile strength, the fibre becoming so brittle as to be capable of being rubbed into a powder.

(*b*) This radical change is accompanied by a great diminution in the cellulose content of the fibre—cellulose being the constituent which makes for durability—and by an extraordinary increase in the proportion of the fibre substance which dissolves in water or in simple chemical reagents.

(*c*) In the baling experiments, six *kutcha* (3½ maunds) bales were made up so as to contain 25 per cent., 30 per cent. moisture. To one bale only water was added and to another water containing a little sugar, the latter being regarded as likely to assist in setting up fermentation or putrefaction changes. The remaining bales were treated with antiseptics. On arrival in London, no serious damage had been sustained by any of the fibre which was, about January 1908, sold in the open market for £23-10-0 per ton. While trade experts who were present at the opening of the bales in London consider that their small size must be taken into account in applying the results to the fibre under conditions of the ordinary bale, the experiments are held to justify tentatively the following conclusions among others :—

(1) That the presence of nearly 30 per cent. of water in clean baled jute causes no evident damage to the fibre, even after many weeks.

(2) The presence of easily fermentable matter associated with excessive moisture is not necessarily harmful. It should be remarked that these conclusions apply only to the conditions under which the bales were made up :—no mention, for instance, is made in the report of the possible effect of the presence of earth or sand, a point which is now being investigated.

Messrs. Cross & Bevan's recommendations for further work, which include experiments on a large scale with antiseptics, are to be regarded as rather premature, pending the complete investigation of the problem.

Distribution of seed.

During the present season over 40 maunds of jute seed have been distributed. It is possible that this work will increase considerably in the future. The Department is now in a position to supply pure jute seed of any ordinary type.

Fibre crops other than Jute.

Flax.—The working up of the flax grown at Pusa in the cold weather of 1907 is giving very satisfactory results, the quantity and quality of the fibre both showing a gratifying improvement. For instance, the proportion of "tow" which, in the first year's experiments, amounted to nearly half of the weight of the good fibre, was reduced last year to nearer one-tenth. At Dooriah the results were even better than at Pusa, and I quote the following figures from the report of the *Belgain* flax Expert, which are based on the working of an area of nearly twenty acres.

	Maunds per acre.
Rippled (thrashed) straw	53
Seed	3 (approximate).
Cleaned fibre	5½

The fibre is valued at £ 50 per ton and the net return on the crop is given as Rs. 115 per acre including the value of the seed and of the tow.

While this estimate seems a sanguine one, it is obvious that flax is a crop well worthy of the attention of planters, not only in Behar but in Assam.

The field experiments with flax in the rabi season of 1908 were practically ruined, partly on account of the short rainfall and the early cessation of the monsoon, but partly also because most of the seed imported from Europe arrived in such a damaged condition that it was unfit to sow. It was thus impossible to collect the material for a bulletin on flax in Assam, which it was proposed to publish ; but it is hoped that this may be done during the coming season.

Regarding the arrival last year of seed from Europe in a damaged condition, experiments have since been made which prove that while it is dangerous to import flax seed in the hot weather or in the rains, even if packed in tinlined boxes, it is quite safe to do so in the cold weather without any special precautions, except that the cases should not be stowed near the engines during the voyage. The explanation is that European seed contains much more moisture than Indian seed and that when the moist seed is brought into a tropical climate during the hot weather changes are set up which

very quickly destroy its germinating power. It is of course an easy matter to thoroughly dry the seed and to store it safely, provided it reaches India in good condition.

Sida.—Experimental cultivation of this crop is proceeding and some progress has been made in the direction of obtaining straight growing varieties as well as in the comparison of the latter as, regards the value of their respective fibres. It is interesting to note that the Imperial Institute, London has, during the last year, reported very favourably indeed on a sample of this fibre. The commercial valuation obtained was £25—£35 per ton with jute from £15—£25 per ton.

Asclepias Similunate.

Seeds of this plant, obtained from Uganda through Professor Gammie, yielded a small amount of fibre last year. It is too early yet to say anything regarding its agricultural possibilities, but the fibre which it yields is of such superior quality as to render careful trials necessary.

Other fibres.

A number of other fibre plants such as *Urena Lobata*—the subject of a recent Agricultural Ledger—*Triumfetta Neglecta, Abutilon Indicum*, etc.etc., are under observation, but none call for any special remark at present.

I wish to express my appreciation of the patient and accurate work done during the past year by G. Srinavason, B.A. (Madras), my Chemical Assistant. Mumhammad Nizamuddin Hyder has done conscientious field work in connection with the very numerous plots which it has been necessary to cultivate.

DATED PUSA,
The 16th September 1909.

R. S. FINLOW, *Fibre Expert*,
Eastern Bengal and Assam.

APPENDIX II.

LIST OF HONORARY CORRESPONDENTS OF THE DEPARTMENT OF AGRICULTURE IN EASTERN BENGAL AND ASSAM ON THE 30TH JUNE 1909.

Dacca.

1. Rai Hara Sankar Chaudhuri, Teota, Dacca.

Mymensingh.

2. Babu Chandra Kishore Dey, Sibganj, Mymensingh.
3. Babu Iswar Chandra Guha, Jamalpur, Mymensingh.
*4. Babu Sarat Chandra Chakrabarti, Gouripur, Mymensingh.

Faridpur.

5. Babu Kali Prasanna Sarkar, Faridpur.
*6. Mr. S. M. Bose, Gopalganj, Faridpur.

Bakarganj.

7. Babu Atul Chandra Dutt, Barisal.
8. Revd. W. Carey, Barisal.

Chittagong.

9. Raja Bhuban Mohan Roy, Chittagong.
*10. Babu Iswar Chandra Nandi, Fatehabad, Chittagong.
11. Dwija Das Dutt, Esq., Chittagong.

Tippera.

12. Babu Anukul Chandra Roy, Manager, Bhukailash Raj Ward's Estate, Tippera.
13. Babu Ananda Chandra Roy, zemindar, Gobindapur, Laksham, Assam-Bengal Railway.

Rajshahi.

14. Babu Kishori Mohan Chaudhuri, Rajshahi.
15. Babu Sarat Chandra Roy, Rajshahi.

Dinajpur.

16. Babu Purna Chandra Sinha, Raiganj, Dinajpur.

Rangpur.

*17. Babu Ashutosh Lahiri, Rangpur.
*18. Babu Rajani Kanta Bhattacharjee, Rangpur.

Bogra.

19. Babu Baidyanath Sanyal, Bogra.
20. Babu Jogendra Nath Sarkar, Bogra.
21. Babu Kashinath Das, Bogra.

Pabna.

22. Babu Prasanna Narayan Chaudhuri, Government Pleader, Pabna.

Cachar.

*23. Babu Man Gobind De Chaudhuri, Silchar.
24. F. A. Brownlow, Esq., Kallein Tea Estate, Cachar.

Sylhet.

25. Babu Abhaya Kumar Dam, Sadhuhati (South Sylhet).
*26. Babu Basanta Kumar Nandi, Itakhola, Sylhet.
27. D. Ferguson, Esq., Dhamai Tea Estate, Dakshinbhag Post Office, Sylhet.
28. Babu Girija Nath Biswas, Kanairkhal Post Office, Jagannathpur, Sylhet.
29. Babu Har Kissor Gupta, Post Office, Pail, Habiganj.
30. Babu Joy Chandra Chaudhuri, Post Office, Dwara Bazar, Sunamganj.
*31. Maulvi Syed Abdul Majid, Sylhet.
32. Babu Satis Chandra Deb, Karimganj.

NOTE.—The names of the Agricultural Associates have been marked with asterisks.

Khasi and Jaintia Hills.

33. U Rai Mohan Dingdoh, Shillong.
34. U Jones Passah, Jowai.
35. U Job Solomon, Cherrapunjee.
36. U Kubur Singh, Shillong.

Goalpara.

37. Babu Dijes Chandra Chakravarti, Manager, Gauripur Estate, Goalpara.

Kamrup.

38. Rai Saheb Chidananda Chaudhuri, Gauhati.
39. Babu Mahendra Mohan Lahiri, Gauhati.
40. Munshi Tayab Ali, Beltola, Kamrup.

Darrang.

41. Babu Syama Charan Maitra, Tezpur.

Sibsagar.

*42. Babu Akshay Kumar Ghose, Sibsagar.
*43. Srijut Debeswar Gossain, Barpathar Sugarcane Farm (Golaghat), Badlipar Post Office.
44. D. S. Withers, Esq., Dessai and Parbuttia Tea Company, Limited, Moriani, Sibsagar.

NOTE.—The names of the Agricultural Associates have been marked with asterisks.

APPENDIX III.

Receipts and Expenditure of the Department of Agriculture for the year ending the 30th June 1909.

Receipts.	Amounts.	Expenditure.	Amounts.
1	2	3	4
	Rs. a. p.		Rs. a. p.
		Experimental cultivation.	
Sale of manures and Farm produce ...	6,913 3 11	Superintendence	78,878 5 9
Sale of silk	52 14 9	*Expert staff.*	
Sale of potatoes	349 8 0	Fibre Expert	13,553 1 10
Other receipts	1,844 8 5	Agricultural Chemist	14,964 4 4
		Experimental Farms.	
Total receipts ...	9,160 3 1	Dacca Farm	25,020 2 6
		Burirhat Farm	8,096 5 6
		Rajshahi Farm	6,992 12 9
		Jorhat Farm	11,180 7 6
		Upper Shillong Farm and Fruit Garden	13,111 13 9
		Wahjain Tropical Plantation ...	1,716 1 8
		Central Seed Depôt	6,685 7 11
		Total Experimental Farms ...	1,80,198 15 6
		Agricultural Demonstrations and Experiments.	
		Establishment for the revival of silk industry in Rajshahi.	6,525 9 2
		Sericultural School, Rajshahi ...	5,486 5 1
		Other Agricultural Demonstrations and Experiments.	
		To distribution of seeds and implements, etc.	1,939 13 4
		To cost of terraced rice cultivation in the Naga Hills.	201 10 0
		Jute demonstration	2,082 4 7
		Public Exhibition and Fairs.	
		Agricultural and Horticultural Exhibition.	2,026 13 6
		Total Agricultural demonstration and experiments.	18,262 7 8
		To registration of riverborne trade ...	4,040 11 4
		To registration of railway traffic ...	405 0 0
		To Provincial Statistics.	
		Frontier roadborne traffic... ...	1,009 0 0
		Internal ditto	908 9 3
		Rain-gauge establishments ...	396 12 0
		Total Expenditure ...	2,06,121 7 9

APPENDIX IV.

Results of the sugar experiment made by Srijut Debeswar Gossain, Barpa'har Sugarcane Farm, Badlipar P. O., Sibsagar district (Assam), during the year 1908-1909.

Particulars.	Amount,	Total.	Remarks.
1	2	3	4
Receipts.	Rs. a. p.	Rs. a. p.	
Received from 1 217 mds. 4srs. 6chs. of rab machined from 3rd April to 3rd June and from 9th August to 14th August 1909—			
10mds. 16srs. 8chs. sugar at Rs. 13-8-0 per maund ...	140 9 0	...	
165mds. sugar at Rs. 12-8 per maund	2,062 8 0	...	
100mds. sugar at Rs. 11-12 per maund	1,175 0 0	...	
204mds. 19srs. 14chs. sugar at Rs. 11-3 per maund ...	2,287 13 3	...	
9mds. sugar No. 2, obtained from 45mds. rab made from molasses at Rs. 7-4-0.	65 4 0	...	
Total price of 488mds. 36srs. sugar ...	...	5,731 2 3	
230mds. 36srs. gur at Rs. 3-12 per maund	866 12 3	...	
263mds. 35srs. 10chs. gur at Rs. 3-8 per maund ...	923 11 3	...	
32mds. 5srs. molasses fit for mixing with tobacco at Rs. 3 per maund.	96 6 0	...	
Total price of gur and molasses ...	...	1,886 13 6	
Total receipts ...	...	7,617 15 9	
Expenditure.			
Expenses of making, etc., of 1,217mds. 4srs. 6ch. rab—			
Crushing cane	166 9 3	...	
Making rab, including oil, soda, fuel, etc	251 5 3	...	
Earthen pots for filling rab	340 2 9	...	
Centrifugalling, including *retha*, soda and fuel ...	168 14 0	...	
Bags and cloth for packing sugar	120 0 0	...	
Making gur from molasses	39 6 6	...	
Earthen pots for filling gur	151 14 0	...	
Making rab from molasses for 2nd sugar	3 4 0	...	
Bags for 2nd sugar; centrifugalling and boiling of molasses for 2nd sugar.	9 15 3	...	
Cost of cultivation	3,336 10 0	...	
Total Expenditure ...	...	4,588 1 0	
Net profit (exclusive of depreciation of machinery and interest on capital).	...	3,029 14 9	

APPENDIX V.

REPORT OF THE SERICUTURAL SUPERINTENDENT.

Introduction.

The ollowing is an account of the sericultural operations in this province from April 1908 to June 1909, giving at the outset a brief description of the work done in this province prior to April 1908.

A short history of the work prior to the commencement of last financial year.

2. Before the Sericultural operations in this province were taken over by Government they were mainly under the supervision of the Bengal Silk Committee, which was assisted by the District Boards of Malda, Rajshahi and Bogra, the three silkworm rearing centres in this province. The efforts of the Bengal Silk Committee were principally directed towards teaching the Basnis at their own homes the more improved methods of rearing by a staff of instructors, and to supplying pure seed to the rearers from nurseries opened in suitable centres. Operations were commenced in Malda in 1898, Rajshahi in 1900, Bogra in 1901. The rearers were also helped by supplies of improved rearing implements, miscroscopes for the examination of the seed, wire netting for the doors and windows of rearing houses to prevent the access of the parasitic fly, and also disinfecting materials and appliances. These were sold to the rearers at cost price to be paid for in instalments which usually fell due after every bund reared.

Sericultural training in schools.

3. Two sericultural classes were opened with the combined effort of the District Board of Malda and the Silk Committee in the primary schools at Sujapore and Jote, Malda. The Diamond Jubilee Technical School at Rajshahi was also aided by a grant of three scholarships of Rs. 6 each and as far as possible the passed students of the school were found to work as travelling instructors and overseers of nurseries. The Sericulrural Class in the Diamond Jubilee Technical School was eventually separated from the Technical School and became a Government institution in 1907.

Opening of nurseries.

4. In 1904, a nursery was opened at Baneswar and two years later another at Kharkhari near Rajshahi.

Management and control.

5. The work as has been already stated was managed by a staff of travelling instructors and overseers in charge of nurseries, generally recruited from the passed students of the Rajshahi Sericultural School or from apprentices trained by the Sericultural Superintendent, Bengal. The Sericultural Superintendent was responsible to the Bengal Silk Committee which received money grants from the Government of Bengal.

Results of the work in this province.

6. The results of the work have been published in the Annual Reports of the Silk Committee from the year 1898, when they first took up the question to the year 1908. The improvement of the two races, Nistari and Choto Polu worms, the supply of good seed of these two races to the rearers, and the instruction of the rearers by a staff of travelling instructors were principally aimed at.

Change of control over the sericultural operations in this province.

7. The Government of Eastern Bengal and Assam took over the control of sericultural operations in this province from 1st April 1908. From that date until November 1908, the work was carried on on the old lines at Rajshahi and Baneswar. As the old state of affairs was found on enquiry to be unsatisfactory, a scheme for the reorganisation of the work was considered and has since been gradually introduced.

Work at Malda.

8. Towards the beginning of December the work at Malda was inspected. The work there was managed by two travelling instructors and a teacher for the sericultural class at the Jote Arapore Primary School. The instruction given to the rearers by the travelling instructors was found to be unsatisfactory, as the instructors were not the right stamp of men for the work, so for the present the instruction of rearers has been dropped.

Nurseries in Rajshahi district.

9. There were three nurseries in the Rajshahi district, one connected with the Rajshahi Sericultural School, one at Kharkhari about 5 miles from Rajshahi, and one at Baneswar, 13 miles from Rajshahi. The nurseries have not been very successful in the past, partly owing to mismanagement on the part of the overseers in charge and partly owing to the fact that the seed from the nurseries got a bad name among the rearers by unscrupulous traders palming off inferior seed on the rearers as nursery seed.

It was therefore decided to open a large central nursery for the supply of good seed free from disease to rearers. This central nursery is under the direct supervision of the Sericultural Superintendent who has his headquarters there. He will be assisted by rearers who will be paid a bonus according to results obtained from their seed in addition to a fixed wage. An account of the new central nursery at Mirganj is given in the next paragraph.

Central Seed Depôt at Mirganj, Rajshahi.

10. The village of Mirganj is situated on the banks of the river Padma about three miles from the Charghat Steamer Station, between Damukdia and Rajshahi. It is situated in what is perhaps now the largest silkworm rearing tract in Rajshahi district, commonly known as the Boralpar Joar. This Joar besides being a cocoon supplying centre is also a seed supplying centre for Malda and the other Joars in Rajshahi. We are much indebted to the District Engineer, Rajshahi, for his valuable suggestion of this site for our Central Seed Depôt which will enable us to meet the demands of rearers in many different and distant Joars.

We have selected the site very near the banks of the river and at a safe distance from the silkworm rearing villages of the locality. The nursery is situated on the spot formerly known as Champacha Indigo Factory belonging to the Midnapur Zemindari Company, Limited. The total area is 70 bighas of land including a silted tank and a godown. Of this, 60 bighas have been cultivated for mulberry plantation, the remaining 10 bighas includes the tank and godown, sites for five rearing houses, one seed examination room, and the necessary officers' quarters.

The following varieties of mulberry will be grown on the area set aside for mulberry cultivation Bengal shrub mulberry, and tree mulberries of the following varieties—M. Multicaulis, M. Alba of Europe, big leaf Khasia and small leaf Khasia mulberry.

The work of mulberry plantation has been fairly started and we hope to finish the planting work by the end of July. We have also almost finished the construction of three rearing houses and a seed examination room ; only the wood work in these buildings remains to be done. Two more rearing houses remain to be built. We have finished the necessary brick work alterations in an old godown on the site, one part of which it is proposed to use for the accommodation of the staff and office, the other part as a godown. We have at present in hand the excavation of the tank, construction of quarters for the Superintendent and other necessary quarters for the staff. Most of these will in all probability be finished by the end of the next dry weather, enabling us to commence sericultural operations from next year.

Description of the nurseries at Baneswar and Kharkhari.

11. The nursery at Baneswar is situated on the main road from Rajshahi to Nattore. It is 13 miles from Rajshahi and 17 miles from the Nattore Railway Station. The nursery contains 12 bighas of mulberry land, a rearing house, and a seed examination room. It has also a tank and quarters for the head rearer in charge of the nursery. The full working capacity of the rearing room is 120 kahans of cocoons in five shelves containing sixty *dalas*.

The nursery at Kharkhari is situated in the northern Joars in the Rajshahi district. It has about 10 bighas of mulberry lands, a rearing shed, and a seed examination room. The capacity of the rearing room is about the same as that of Baneswar.

Account of the work done at the nurseries from April 1908 to June 1909.

12. We reared six crops at Baneswar for the supply of seed to rearers besides a few minor crops for the purposes of experiment and keeping on our own seed. There were six crops also at Kharkhari for the supply of seed to rearers.

As has been stated, we carried on the old lines of work last year, and the strength of our staff being very limited, we could not ascertain the result of our seed in the rearers' home bund by bund. An enquiry now in those cases does not bring any accurate statements, as in most cases the rearers could not definitely remember the results, the local Joar seed as well as the nursery seed having been reared in the same home. As far as it could possibly be ascertained, in the absence of any report of failure of crops from nursery seed, the average results of the nursery seed at the rearers' homes were as follows—one seer of seed cocoons resulted in an outturn of 1½ to 2 maunds of green cocoons.

The total expenditure incurred for all the crops at Baneswar and Kharkhari amounted to Rs. 751-8-0, and the receipts realised from the sale of the seed from the various crops to Rs. 815-6-0.

Expenditure.

13. The total expenditure during the period amounted to Rs. 7,308-1-5, spent under the following heads :—

	Rs.	a.	p.
Establishment	2,413	5	3
Petty construction	2,245	15	2
Reclamation	1,170	15	0
Wages of labour	1,275	0	9
Petty repairs	48	14	6
Postage	21	7	0
Telegrams	14	15	0
Seeds	45	0	0
Taxes	2	10	0
Miscellaneous	69	14	9
Total	7,308	1	5

Strength of staff.

14. The staff at present comprises a Superintendent for the province, a travelling overseer, three head and under rearers, and one office peon. The following posts remained to be filled—one clerk, three head and under rearers, and one travelling overseer. These will be filled as soon as qualified men for these posts are available.

E. B. & A. G. P. (Agri.) No. 69—700—7-1-1910—G. N. K.

Resolution on the Report of the Agricultural Department, Eastern Bengal and Assam, for 1908-1909.

Extract from the Proceedings of the Lieutenant-Governor of Eastern Bengal and Assam in the Education Department, No. 3242E., dated the 24th December 1909.

READ—

The Report of the Department of Agriculture, Eastern Bengal and Assam, for 1908-1909.

RESOLUTION.

THE report on the working of the Agricultural Department during the year 1908-1909 is a record of painstaking and energetic work which, though carried on under conditions which are still somewhat adverse, has yet achieved a very encouraging measure of success. The adverse conditions are due in part to the continued necessity for economy, and in part (though this is also in the main a consequence of the scarcity of funds) to the lack of official supervision. It was not possible to complete during the year the laboratories and residences for the expert staff at Dacca, with the result that the Department still failed to secure the full benefit of the services of at least two of its experts. But the Lieutenant-Governor is gratified to observe that, in spite of these drawbacks, the expert staff of the Department adapted itself to circumstances, and accomplished much invaluable work, which materially assisted the Director in the general organisation and advancement of his charge.

2. It is essential to the success of its schemes and the utility of its experimental demonstrations of agricultural improvements that constant supervision should be exercised not only over the work of the inferior officers of the Department itself but over the experiments entrusted to the unofficial associates. But the field over which the activities of the Department are spread is so immense that it will be impossible to secure this to an adequate extent until the supervising staff at its disposal has been very largely increased. That the results of experiments and demonstrations carried out during the year were not fully commensurate with the trouble and the money expended upon them, is not therefore surprising, since owing to the want of adequate supervision, the expenditure was sometimes misdirected. But the energy and interest which has been displayed by the officers of the Department should soon remedy these defects, and are of good augury for the future. The Lieutenant-Governor notices with especial pleasure the Director's appreciation of the valuable assistance rendered by the Honorary Correspondents and Associates, and in particular desires to congratulate Srijut Debeswar Gossain of Barpathar upon his enlightened efforts to improve agricultural methods generally and especially the production of sugar, and upon the success which has attended his operations in the past year.

3. The management of the Rangpur Experimental Farm was transferred to the Rangpur Agricultural Association during the course of the year. The Association will continue to receive material financial assistance both from Government and from the District Board, and the transfer to it of the management of the farm will not mean any diminution of the interest displayed in it by the Director and his staff. The experiments conducted on the Farm met with a very considerable measure of success and it is hoped that the Association will be able to convert these experiments into demonstrations, and to do something, with their help, to improve the standard of agriculture in the district. The progress of the farm will be watched with much interest, and it may be hoped that it will rapidly assume an assured position as a valuable product of independent effort towards agricultural improvement. The work done on the five agricultural stations at Dacca, Rajshahi, Burirhat (Rangpur), Jorhat, and Shillong, though still to a large extent experimental in character, showed promise. At Dacca, in particular, the year was one of considerable progress and development.

4. An advance was made during the year in the spread of potato cultivation, in the improvement of the class of potato generally sown, and in the methods of cultivation in areas where the crop has already become established. The superiority of the Naini Tal and Darjeeling varieties over the plains product was established and the wide distribution of the 400 maunds of seed of these two varieties imported by the Department will, it is hoped, assist the general improvement of the quality of this crop, which has practically assured for itself the position of an important staple. The experiments conducted in Chittagong with a view to introducing the cultivation of jute in that district have progressed sufficiently to demonstrate that the crop will thrive as well there, in suitable soil, as in other recognised jute-producing districts.

5. With the help of Major Cole's personal interest and care, the poultry-breeding operations in the Lushai Hills have met with a considerable measure of success, but it has not been possible to effect much in this direction in any other part of the Province. Government has recently decided to abandon the experiment at the Shillong Farm, and it is hoped that the transfer of the stock to Dacca, and the development of the scheme at the Dacca Central Farm, where it will secure Mr. Meggitt's personal supervision, will result in more practical results than those hitherto attained. It is satisfactory to note that there is a general demand for information on the subject. It is intended to meet this by the publication of a bulletin to be based upon the report compiled by Babu Ambika Charan Dutt with the addition of notes by Mr. Meggitt.

6. Operations for the spread and improvement of Sericulture have only recently been directly undertaken by the Department under a trained supervisor. The report shows that the work to be done to place the operations on a sound footing will tax the energy of our officers for some time to come. In particular, the use made of the sums of money granted to passed students of the Sericultural School requires closer supervision, as the Director has pointed out. The system of lump grants is clearly unsatisfactory, and is liable to abuse, and it should probably be replaced by a more cautious system of advances, to be adjusted after inspection and verification of the work done. The infant industry in the Khasi Hills continues to show signs of healthy growth.

7. With the many other direct calls upon its attention, it is not to be expected that the Department can do much for the encouragement of industries only distantly allied to agriculture. Signs are not wanting that an organised attempt to improve methods of weaving might meet with very general support. Government has under contemplation the establishment of a separate Department of Industry and Commerce, but until this is accomplished, its officers cannot give much assistance in the sphere of industrial education or the practical encouragement of indigenous industries.

8. For the scientific training of students in agriculture proper, this Province remains for the present dependent upon the courtesy of the Bombay Government in admitting students from this Province to the Poona Agricultural College and upon the kindly interest which the Principal continues to evince in their welfare. The Dacca Central Farm has provided a practical training for four apprentices during the year, but this is at present the only provision for general training of the kind within the Province of which our resouces will permit.

9. The Lieutenant-Governor attaches great importance to the duties of the Director as in the matter of the improvement of arboriculture. It is hoped that the District and Local Boards will do their utmost to assist him in finding candidates who will avail themselves of the course of training which the Superintendent of the Royal Botanic Gardens at Sibpur has agreed to provide, and to make the most of expert advice when it is available. The work of laying out the new station of Dacca will occupy most of the time of the arboricultural expert whose services have been secured temporarily by this Government, but it is hoped that it may be possible to obtain more permanent assistance for the Director in this important branch of his work before long.

10. The Lieutenant-Governor is glad to see that the Director has not overlooked the importance of publishing bulletins and leaflets as a means of bringing home to the public the objects of the Department and of advertising the results of the experiments made by it, and he anticipates much benefit from the wide circulation which it is proposed to give to the Department's year book. His Honour learns with pleasure that the author of this publication has paid special attention to the matter of its

translation into the vernacular, and has not failed to perceive that it is essential to its utility that it should be composed in the simplest language, such as is likely to appeal to, and be understood by, the cultivating classes for whose guidance it is primarily intended.

11. Mr. Hart's direction of the Department throughout the year was characterised by the zealous attention to the work of all its branches that has distinguished his work since he assumed charge of its operations, and an appreciable portion of the furlough which he has been forced to take as the result of his regrettable illness will be utilised by him in agricultural enquiries and study connected with the special problems which the Department has to solve in this Province. The thanks of Government are due to him for his successful labours throughout the year, and to Mr. Strong for his interesting report.

By order of the Lieutenant-Governor,

H. LEMESURIER,

Chief Secretary to the Government of Eastern Bengal and Assam.

E. B. & A. G. P. (Agri.) No 69—700—28-12-1909.

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REPORT

OF THE

AGRICULTURAL DEPARTMENT,

EASTERN BENGAL AND ASSAM,

FOR THE

year ending the 30th June 1910.

132930

SHILLONG:
PRINTED AT THE EASTERN BENGAL AND ASSAM GOVERNMENT PRINTING OFFICE.

1910.

No. 11676G.

FROM

F. W. STRONG, ESQ., I.C.S.,

OFFG. DIRECTOR, DEPARTMENT OF AGRICULTURE,

EASTERN BENGAL AND ASSAM,

To

THE SECRETARY TO THE GOVERNMENT OF EASTERN BENGAL AND ASSAM IN THE REVENUE AND GENERAL DEPARTMENT.

Dated Shillong, the $\frac{15}{20}$*th September* 1910.

SIR,

I have the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1910.

I have the honour to be,

SIR,

Your most obedient Servant,

F. W. STRONG,

Offg. Director of Agriculture, Eastern Bengal and Assam.

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REPORT

OF THE

AGRICULTURAL DEPARTMENT,

EASTERN BENGAL AND ASSAM,

FOR THE

Year ending the 30th June 1910.

CHAPTER I.

General Administration.

Members of the staff.

1. Mr. J. E. Scott was in charge of the Department from 1st to 30th July, when he was relieved by me. I held charge for the remainder of the year. The appellation of the Assistant Director has been changed to Deputy Director. The post of Deputy Director was held by Rai Bahadur B. C. Basu throughout the year, except for the period from 1st July to 20th August, when he was on furlough, and Mr. A. G. Birt officiated for him. Orders were received during the year sanctioning the appointment of a second Deputy Director. Mr. A. G. Birt, who joined the Department in June 1908, has been appointed to this post. Messrs. R. S. Finlow and A. A. Meggitt continued to fill the posts of Fibre Expert and Agricultural Chemist, respectively. Mr. G. P. Hector joined the Department as Economic Botanist on the 23rd July 1909. Mr. J. N. Chakrabarti, Agricultural Supervisor, was in charge of the Dacca Farm throughout the year. Two more posts of Agricultural Supervisor remain to be filled up. Proposals have been submitted to Government for the appointment of a fourth Agricultural Supervisor in order to make provision for a Personal Assistant to the Director. Babu Guru Charan Chaudhuri, Sub-Deputy Collector, continued during the year to be on special duty at the headquarters office and performed the duties of a Personal Assistant with the title of Agricultural Supervisor.

During the year there were no changes in the subordinate staff of the Department.

Mr. M. M. Chakrabarti held charge of the Sericultural operations in Rajshahi, Malda and Bogra, except for a few days at the close of the year when he was on privilege leave.

Mr. R. L. Proudlock, Curator of the Botanical Gardens at Ootacamund, Madras, whose services were lent to this Province for one year, joined the Department on the 6th July. Towards the close of the year orders of Government were received sanctioning the appointment of a European Gardener for this Province and appointing Mr. Proudlock to that post.

Director.

2. Mr. Scott made no tours. I spent 162 days on tour and visited the following districts, namely, Dacca, Chittagong, Noakhali, Tippera, Rajshahi, Rangpur, Sylhet, Cachar, Goalpara, Sibsagar, Manipur and the Naga Hills. I inspected all the Agricultural Stations of the Department, as well as the Khas Mahal Farm at Chittagong, and some Veterinary dispensaries. I inspected the boat registering stations and some of the road stations at Chittagong. While at Manipur I discussed many questions with the Political Agent relating to the improvement of agriculture in the Manipur State and also visited one of the Sericultural Stations of Messrs. Anderson, Wright & Company. I visited the Agricultural and Industrial Exhibition held at Dhubri, attended a Conference of Provincial Agricultural Officers at Dacca in January and also the annual meeting of the Board of Agriculture held at Pusa in February. On my way to Pusa I paid a visit

to the Bengal Agricultural College at Sabour. I visited Calcutta in September in connection with the final jute forecast. I also paid a visit to the Bengal Veterinary College at Belgachia.

Deputy Director.

3. Mr. Basu returned from leave and took over charge from Mr. Birt on the 21st August 1909. Between that date and the close of the year, he spent 134 days on tour, exclusive of visits to the Upper Shillong Farm. He paid nine visits during the year to the Government Tobacco Farm at Burirhat and inspected the Association Farm at Rangpur five times. He spent a considerable time in organizing the Government exhibits at the Dhubri Exhibition and visited the place five times during the year. Mr. Basu made two short tours in the Khasi Hills and one in the Assam Valley, in the course of which he visited Jorhat, Sibsagar, Dibrugarh, Lumding, and Srijut Debeswar Gossain's well-known sugarcane plantation at Barpathar. In February he was deputed for a short visit to Cooch Behar to study the method of curing tobacco by fire. He took part in the Provincial Agricultural Conference held at Dacca in January and represented the expert staff of the Province at the annual meeting of the Board of Agriculture held at Pusa in February. Since his return from leave, Mr. Basu has been entrusted with the duty of supervising the work of the two Agricultural Stations near Shillong and the Tobacco Experiment Station at Burirhat.

Second Deputy Director.

4. Mr. Birt's officiating term of appointment expired on the return of Mr. Basu from leave on the 21st August and from the 22nd August he was appointed to the newly sanctioned post of Second Deputy Director of Agriculture. He was entrusted with the supervision of Dacca, Rajshahi and Jorhat Agricultural Stations, the Seed Depôt at Dacca, and the Sericultural Nurseries at Mirganj, Banesvar and Kharkhari. He was on tour for 202 days, visiting the Agricultural Stations named above several times and making other local enquiries. He visited Dhubri twice in connection with the Exhibition and attended the meeting of the Board of Agriculture at Pusa as a visitor. In the beginning of April he inspected the Experimental Farm of the Gauripur Zemindar in the Mymensingh district and also the Khas Mahal Farm at Chittagong.

Fibre Expert.

5. Mr. Finlow's headquarters were removed from Pusa to Dacca in May 1910. During the year he continued the study of the races of jute in collaboration with the Reporter on Economic Products and conducted experiments in cross fertilisation with various races of this crop. He gave advice in connection with the experimental trials with jute in this Province and in other parts of India. The experimental cultivation of flax and of a number of other fibres including several varieties of Hibiscus, Sida, Sunnhemp, etc., also, received his attention. Mr. Finlow's investigation into the cause and possible prevention of "Heart Damage" in jute has not been completed yet. He has been asked to submit a report on the results of the experiments conducted on this account as early as possible. Fuller details of Mr. Finlow's work will be found in Appendix I.

Agricultural Chemist.

6. Mr. Meggitt was on tour for 107 days and visited the Jorhat Farm several times, Burirhat Farm, Shillong, Chittagong and Cox's Bazar once. He attended the annual meeting of the Board of Agriculture at Pusa as a visitor. He was occupied for the greater part of the year in superintending the fitting and furnishing of the Laboratories at Dacca. He was unable to commence work in the Laboratory till towards the close of the year. Mr. Meggitt had to devote a considerable amount of time to experimental sugarcane work on the Jorhat Farm in collaboration with Mr. Birt, and some of his time was taken up in organising a poultry breeding experiment on the Dacca Farm and in enquiries connected therewith.

Economic Botanist.

7. On his joining the Department, Mr. Hector spent the first few months in organizing his office and superintending the fitting up of the Botanical section of the Dacca Farm Laboratory. In October 1909 the Imperial Cotton Specialist visited this Province, and Mr. Hector made a tour with him in the Garo Hills and the Chittagong Hill Tracts to investigate the cottons of those localities and the possibility of their improvement. Mr. Hector has been entrusted with the work of supervising the Tropical Plantation at Wahjain. He visited the Plantation three times during the year. He visited the Jorhat Farm once and Shillong twice. He also attended the Board of Agriculture at Pusa as a visitor. Mr. Hector has taken in hand a detailed survey of the more important varieties of transplanted *Aman* rice as well as of mustard *til* and pulse crops grown in the Province. A commencement has also been made

with the work of laying out an experimental area for general plant-breeding work and for the experimental growing of such fruit trees as are likely to succeed under the conditions of soil and climate which prevail on the Dacca Farm.

Agricultural Supervisor.

8. Mr. J. N. Chakrabarti, in addition to his duties as the Superintendent of the Dacca Farm, paid two visits to the Burirhat Farm in connection with the curing of tobacco. He attended the Dhubri Exhibition and assisted in the agricultural demonstrations held there. A part of his time was spent in occasional tours in the interior of the Dacca district which he visited for the purpose of making himself acquainted with local agricultural practices.

Farm Superintendents.

9. Babus Jamini Kumar Biswas and Harkumar Guha, Srijut Binaram Das and U Herrick Singh continued to be in charge of the Burirhat, Rajshahi, Jorhat and Shillong Experimental Stations, respectively. Jamini Babu was deputed to Cooch Behar on two occasions, for a short period each time, to study the method of curing tobacco by fire; and he as well as Babu Harkumar Guha assisted at the Dhubri Exhibition. Babu Rajeswar Das Gupta held charge of the Seed Depôt at Dacca. He spent 230 days on tour, of which 105 days were in connection with the selection and purchase of seeds and the rest principally in connection with the Exhibitions at Dhubri and Malda. Babu Kali Das Roy was on special duty for building work at Rajshahi, Mirganj and Dacca. All of the abovenamed officers attended the Conference of Provincial Agricultural Officers held at Dacca in January 1910.

Entomological and Mycological Collectors.

10. On the completion of his training at Pusa Babu Prafulla Chandra Sen took up the duties of the Entomological Collector at Dacca on the 9th August 1909. He was on tour for 120 days and visited several places in connection with the outbreak of insect pests of rice, jute, mustard and other crops. He also attended the Dhubri Exhibition with specimens of insects injurious to important crops. He explained to the visitors the life histories of these pests and demonstrated methods of combating them. During the rest of the year he was engaged in the investigation of insect pests at Dacca. One of the pests under investigation was the mango weevil. He has been directed to proceed with the investigation of this pest in the Plains Districts of the Province, and I have requested the District Officers to render him all possible help in the work. Several methods of preventing and curing insect ravages, such as, spraying, bagging, fumigation and hand-picking were resorted to on the Dacca Farm. Cultivators living near the farm were instructed by him concerning insect pests and the remedies for them. The Entomological Collector gave a short course of instruction to the apprentices on the Dacca Farm in the rearing of insects and the application of insecticides and other methods of checking insect pests.

Babu Amrita Lal Som, after having gone through a course of training at Pusa, was appointed Mycological Collector with headquarters at Dacca. He joined his post on the 12th March 1910 and was occupied till the close of the year mainly in collecting diseased specimens of economic and wild plants in order to form a reference collection of mycological specimens. His work was mostly limited to the Dacca Farm and its neighbourhood. He paid a visit to the Government Plantation at Wahjain and found that although the orange blight did not exist on the Plantation, it prevailed with more or less severity in most of the neighbouring gardens.

Honorary Correspondents and Associates.

11. The Honorary Correspondents continued to furnish very useful information to the Department regarding the condition of crops and the prevalence of insect pests. Some of the Associates undertook special demonstrations and the results obtained are noted in Chapter III. But very little progress could be made in this direction for want of a staff to supervise such work. With a view to encourage Associates and Correspondents to make agricultural experiments and demonstrations it was decided at the Conference of Agricultural Officers held at Dacca that (i) when an Associate or selected cultivator proposes to make a particular demonstration with the approval and under the supervision of the Department, he should be assisted with free gifts of seeds and manures ordinarily to the value of Rs. 50 (excluding freight) and the free use of implements or machines required for such demonstrations, and (ii) if a Correspondent or Associate asks for any seeds, manures or implements for the purpose of experiment on his own account, he will be supplied with these at half cost, provided the total cost to the Department (excluding freight) during any one year

does not exceed Rs. 25. A list of the Honorary Correspondents and Associates is given in Appendix II.

Agricultural Associations.

12. During the year there were two Agricultural Associations, *viz.*, one at Bogra and the other at Rangpur. Some members of the Bogra Association made experiments with Dacca Ganderi cane, Nainital Potato, and Bakarganj Balam paddy and the results were generally satisfactory. The Association held one meeting towards the close of the year and discussed measures for the improvement of the agriculture of the district.

The Rangpur Association held no meeting till towards the close of the year when it met once under the Chairmanship of Mr. J. McSwiney, the present Collector. The management of the Rangpur Farm has been vested in the Rangpur Agricultural Association since 1st August 1908. Government has paid so far a sum of Rs. 3,000 as contribution for the 12 months ending the 31st July 1909 and a further contribution of Rs. 3,000 is due for the year which closed on the 31st July 1910. The principal crops grown during the year were rice, jute, sugarcane, tobacco, ginger, oats, wheat, mustard and potatoes. The cultivation of rice and jute was entrusted to a number of local raiyats under an arrangement which allowed them a share of the produce, but the men did not pay proper attention to the cultivation, and the crops grown by them were more or less poor. It is reported, however, that some of the raiyats have introduced in their own holdings the fine varieties of rice which they grew on the farm, and so far the plan which aimed at bringing cultivators into closer touch with the farm has met with a certain measure of success. The only crops grown during the year which gave noteworthy results were sugarcane, ginger, wheat and potatoes. Two new varieties of sugarcane, *viz.*, Dacca Ganderi and striped Tanna, were compared with the two common canes of the district—Vandamukhi and Kajla. All the four varieties grew well, though they were considerably injured by the cyclone in October last. The Dacca Ganderi cane came out at the top and gave an extraordinary heavy yield of *gur*. In one experiment it gave an outturn of about 5 tons and in other of 6 tons of jaggery per acre. This variety as well as the striped Tanna seems to have taken the fancy of some cultivators, who purchased a considerable quantity of cuttings from the farm for planting in their own holdings. Four varieties of ginger—Jamaica, Cochin, Calicut and country—have been under trial for several years past in the farm. The Jamaica and Calicut varieties gave satisfactory yields last year. The main interest of the experiment lays, however, in the superiority of the Jamaica ginger in point of quality. It was found on chemical analysis to contain less fibre (18·14 per cent.) and a higher proportion of extractive matter (2·51 per cent.) than the country variety which gave 27·66 per cent. of fibre and 1·82 per cent. of extractive matter. The Cochin and Calicut varieties occupied intermediate proportions of these ingredients. Two experiments were made with wheat: one was intended to test the effect of green manuring with Dhaincha. The crop in this experiment gave a poor yield, but it was enough to show the beneficial effect of the green manuring which enhanced the yield by nearly 2 maunds to the acre. The other experiment was designed to contrast local with Gangajali wheat. The local variety gave a much higher outturn, 13 maunds 26 seers against 7 maunds 14 seers per acre, from the Gangajali variety, though in respect of quality the latter was greatly superior. The experiment with potatoes served only to bring out the fact now well recognised that the Darjeeling variety of which seed is imported from the hills, is far more productive and produces larger and more attractive tubers than the local plains potato, but it is at the same time much more subject to disease than the latter and is wanting in keeping quality. Twenty-four maunds of Darjeeling seed potatoes was distributed on payment to a number of local cultivators, who are reported to have obtained very satisfactory yields, but they found great difficulty in disposing of their produce in consequence of the general belief which is too well founded that these potatoes do not keep well long enough.

The farm sold small quantities of different seeds to the public during the year. Among these were 16,058 cuttings of sugarcane, about 24 maunds of Darjeeling potatoes, and 5 maunds of paddy.

The receipts of the farm from the sale of produce and seeds sold amounted during the year to Rs. 1,611-9-7 and the expenditure during the same period to Rs. 6,341-10-8.

As the Farm has done very little work in the way of demonstration and has failed to attain the object with which it was originally started proposals have been submitted to Government after the close of the year to withdraw the Government grant.

13. The annual Conference of Agricultural Officers of the Department was held at Dacca on the 3rd January 1910 and 3 subsequent days. It gave an opportunity for interchange of views on various matters pertaining to the work of the Experimental Stations and to matters of general agricultural interest. Mr. K. C. De, I.C.S., attended one of the sittings as a visitor and suggested certain directions in which experiment in agricultural co-operation might be tried.

Provincial Agricultural Conference.

14. The Dacca Farm Laboratory together with its fittings as well as the officers' residences at Dacca were completed during the year. The Laboratory came into working order towards the close of the year. Good progress was also made during the year with the building of quarters for the subordinate staff on the Dacca and other farms. These buildings are being constructed under departmental management. A few more quarters still remain to be constructed. Some improvements and alterations to the Dacca Farm buildings were carried out during the year with the result that the efficiency of the buildings was improved, space was economised, and the necessity for extension obviated. A brick threshing floor and several *pucca* roads and paths were also constructed.

Buildings.

15. The receipts of the Department amounted to Rs. 11,882-8-9 during the year and the expenditure to Rs. 3,19,640-8-1 against Rs. 9,160-3-1 and Rs. 2,06,121-7-9, respectively, in the preceding year. The principal heads of account are shown in Appendix III.

Financial.

16. During the year the two Deputy Directors of Agriculture, Messrs. Basu and Birt, displayed laudable energy in supervising the work of the various Agricultural Stations entrusted to their care. The interest taken by the former in the Tobacco experiments at Burirhat has been productive of satisfactory results, while the latter did good service in the uphill task of getting the Central Farm at Dacca into shape. *Messrs. Finlow, Meggitt and Hector have all done good work in their respective spheres, though the two latter were much hampered by the noncompletion of the Laboratory till late in the year. Mr. J. N. Chakrabarti, the Agricultural Supervisor in charge of the Dacca Farm, is well reported on by Mr. Birt under whom he worked.* Amongst the Farm Superintendents Babu Rajeswar Das Gupta did very useful work in connection with exhibitions, while Babu Jamini Kumar Biswas conducted experiments in tobacco growing and curing in a very capable manner. Babu Kali Das Roy was in charge of building works on several farms and his engineering training enabled him to conduct them both efficiently and economically.

Officers of the Department.

CHAPTER II.

AGRICULTURAL STATIONS.

17. The work of the Dacca Farm is still mainly preparatory. The highland is not yet fit for experiment, so our efforts were directed to standardizing the land by cropping uniformly on large blocks. Green manuring with *dhaincha* is being extensively practised with the object of bringing the land into a better state of fertility. Experiments were almost entirely confined to winter paddy on the low land. The results of the manurial experiments indicate that soluble manures, such as saltpetre and ammonium sulphate, will not pay on this class of land. Both bonemeal and green manure have given good results. In the planting and spacing experiment the first year's results seem to indicate that the number of paddy seedlings transplanted per acre can safely be reduced without danger of diminution of crop, but no definite conclusions can be drawn until the experiment has been repeated. A small area of *rhea* is being tried on the high land, but it is too early yet to say whether it will be successful. Flax was also tried last cold weather, but was not successful. During the year, extensive alterations and improvements were made in the Farm buildings and a large *pucca* threshing floor was laid down. Quarters were completed for the Seed Depôt Superintendent and his clerk, the Entomological Collector, and for six Laboratory clerks and fieldmen. It is proposed during the current year to construct the remaining quarters required for the Laboratory staff. A large area of some of the best varieties of jute is being grown this year to supply the Bengal Agricultural Department and ourselves with seed.

Dacca.

Rajshahi.

18. The experiments at Rajshahi were mainly concerned with sugarcane, winter paddy, jute, potatoes and groundnuts. The winter paddy experiments were designed to duplicate those in progress at Dacca. Several varieties of sugarcane including Dacca *Ganderi*, Local *Khagri* and *Samsara* were planted for comparison. Groundnuts were tried for the second year as a new crop to the district. Potato experiments were designed to test the Nainital variety against the Darjeeling variety, plains seed *versus* hill seed, and small sets *versus* medium sets. The above experiments were, however, valueless on account of a combination of unfortunate circumstances. The paddy experiments and groundnuts were spoilt by flooding, the sugarcane did not germinate evenly and was therefore useless for experiments, and the potatoes were planted too late owing to the first consignment of seed having been wrecked in the cyclone. The alignment of the proposed railway from Godagari to Nator cuts right across the farm and if it be adhered to, the farm may have to be abandoned. I am in correspondence with the Railway authorities on the subject.

Burirhat (Rangpur).

19. The farm came into full working order during the year. The soil has been found on analysis to be extremely deficient in lime, and an experiment has been instituted with the object of ascertaining if the application of lime will improve the chemical and mechanical character of the soil. Almost the whole of the farm area was cropped, both in the *Bhadoi* and the *Rabi* season. The crops grown were tabacco, cowpea and *dhaincha* as green manure, jowar as fodder, *aus* rice, *matikalai*, oats, mustard, potatoes and groundnut. The tobacco crop which comprised several exotic varieties grew on the whole very well and gave a satisfactory yield. An experiment in the flue-curing of cigarette tobacco, which consists in drying the tobacco rapidly by means of artificial heat was started during the year and gave an encouraging result. Some of the cigar leaf tobacco, which was cured in the shade, appears to have turned out well. Several valuations of tobacco grown on the farm were received and although the experts who were consulted have pointed out defects, they have generally expressed a favourable opinion of the samples submitted to them. Cowpea grew extraordinarily well on the farm and was found to be very useful for green manuring. A number of raiyats living near the farm have begun to grow cowpea for this purpose. *Dhaincha* grew fairly well and was ploughed in as green manure. *Aus* rice, oats and *matikalai* all grew well, but the yield of grain was somewhat poor owing, it is believed, to the want of lime in the soil. The mustard crop failed for want of moisture in the soil over the greater portion of the area sown. Potatoes were grown without irrigation and did tolerably well. The Darjeeling variety gave a larger yield than the local *silbilati*, though it compared unfavourably with the latter in respect of freedom from disease. Jowar was grown as fodder and grew with great luxuriance. The groundnut crop came up well, but fell a prey to fungus disease during the rains. Late planting is being tried this year as a means of averting the disease.

Jorhat.

20. The main crop on this farm is sugarcane. We are at present experimenting with several varieties with a view to determining the best variety for the conditions prevailing in Upper Assam. During the year under review the two varieties Kheri and Striped Mauritius were far superior to other varieties. This confirms previous year's experience. We are giving them a final trial this year and shall probably be able to make definite recommendations after this year's results are obtained. Our object then will be to grow as large an area as possible of the selected variety or varieties for seed for distribution to cultivators. In a small manuring experiment the effect of lime on this soil was demonstrated. On the area treated with lime, linseed, gram and oats grew fairly well although the yields were poor, whereas on the non-limed area they failed altogether. Full details of these experiments will be found in the annual report of the farm.

Upper Shillong.

21. Experiments were made with potatoes, flax and a number of fodder crops. Several varieties of potatoes have been under trial for some years. Among these Magnum Bonum, which is identical with the variety known as Nainital, and King of potatoes continue to maintain their superiority. Arrangements have been made to distribute seed of these two varieties among Khasi potato growers. The usefulness of rape cake as manure for the potato crop has been proved. Cut sets obtained from large tubers have been found to give a larger outturn than small tubers used uncut. The use of Bordeaux mixture failed during the year to prove its efficacy as a check on potato disease owing to the extremely wet nature of the season. Some two hundred maunds of

seed potatoes were grown for the purpose of distribution in the Plains. The experiment with flax is intended to test whether good seed of this crop can be raised in the Khasi Hills. No conclusion has yet been reached on this point. Several species of exotic clovers and grasses were tried during the year, but none of these proved a success. Two species of native grass named *U Langtylli* and *U Proot*, which are being cultivated, promise to do well as fodder. The experiment in the making of silage was repeated during the year with fairly successful results. A new masonry silo was used for the first time and the silage obtained from it came out in excellent condition.

Cattle breeding is being continued. A large number of undesirable animals were weeded out during the year. The young Patna and crossbred Patna-Bhutia bulls are full of promise. Owing to the great difficulty of keeping the animals in good condition during the winter, there is a proposal to shift the herd for the winter months to a warmer locality where grazing will be available. A site on the Gauhati road near Naya-Bunglow has been selected for the purpose, and I am now in correspondence with the Deputy Commissioner for taking a year to year lease of this area. The experiment mentioned in my annual report for 1908-1909 in crossing some ewes of the local breed with a Dumba ram has been yielding very satisfactory results, the crossbred sheep showing a great improvement on the indigenous stock.

Fruit Station.

22. As noted in my previous annual report, the prospects of the English fruit trees do not appear to be favourable. The early setting in of the monsoon interferes with the setting of fruit, and most of the fruit gets knocked off the trees by wind and rain. The great prevalence of insect pests and fungus diseases is another serious impediment to the success of fruit culture in the Khasi Hills. Among the fruits that have proved successful to some extent are peach, apricot, fig, strawberry, tree tomato. Rhubarb and asparagus too have done very well. The Fruit Station has been instrumental in popularising the cultivation of these fruits and vegetables. The question as to whether the Station should be maintained or abandoned has been engaging my attention. I am awaiting for advice on this point from the Imperial Economic Botanist, Mr. A. Howard, who is expected to visit Shillong early next cold weather. Mr. R. L. Proudlock, Arboricultural Expert, visited the garden twice during the year and has submitted a number of suggestions for its improvement. I do not propose to take action on these suggestions until the future of the Station has been decided.

Wahjain.

23. Work at Wahjain has proceeded on the same lines as formerly. The experiments in budding oranges on all the available varieties of local citrus are being continued, but have not met with much success up to date. These experiments are being carried on with the object of studying the effect of the stock on the scion and the possibility of producing plants which may prove immune to the fungus disease which attacks oranges in the Khasi Hills. The question of the improvement of the method of distilling lemon grass oil and of the quality and chemical composition of the oil produced by the different varieties of grass is being taken up by the Economic Botanist in conjunction with the Agricultural Chemist, but the question of finding a ready market for the oil still remains a difficulty, and unless this can be solved, the industry may have to be abandoned. Owing to the rocky nature of the soil on the Plantation and the heavy annual rains which tend to wash away the soil from the slopes, it is clear that some of the plants will have to be removed to a more level situation where the soil is richer and deeper and this annual denudation does not take place.

CHAPTER III.

Progress in introducing Agricultural Improvements.

Central Seed Depôt.

24. The Central Seed Depôt, which was established at Dacca in November 1908 continued to do useful work in the way of supplying seeds, manures and implements. The total quantity of seeds and plants distributed from the depôt during the year aggregated 534 maunds, of which the chief items were potato 234 maunds, paddy seed 100 maunds, *dhaincha* 61 maunds, jute 48 maunds, wheat 39 maunds and oats 30 maunds. Besides, some sugarcane cuttings, plantain shoots and pine-apple suckers were also supplied. Many requisitions for seeds received from Bengal and other Provinces were complied with.

As far as possible, the seeds supplied were grown on Government Farms or were purchased direct from raiyats by officers of the Department. Care was taken to test the quality of the seeds before issue. Besides seeds, a small quantity of bonemeal and a few implements, such as Planet Junior hand-hoes and several types of improved ploughs, were also supplied. The total number of persons, exclusive of Farm Superintendents, supplied with seeds, manures and implements during the year was 110, of whom 35 belonged to other Provinces.

The total expenditure of the depôt during the year amounted to Rs. 9,747-9-3 which includes a sum of Rs. 3,074 spent on petty construction and Rs. 3,573-14-4 paid for establishment. The receipts derived from recoveries of the prices of seeds supplied amounted to Rs. 1,082-13-0. Seeds, manures, etc., to the value of Rs. 1,292-13-0, were supplied free of charge to the Experimental Stations and to Agricultural Associates and Correspondents of this Department.

Cotton.

25. Mention was made in the annual report for 1908-1909 of the attempts made by this Department since 1908 to introduce *Buri* cotton in the hill districts of the Province and of the distribution of seed made in 1909. Owing to delay in the receipt of the seed, the cultivation failed in every place except at Lumding. A fresh distribution of seed has been made again this year. Mr. Basu visited Lumding in April last and found on enquiry that some thirty Mikirs and a few Kachari cultivators had grown small areas of this cotton on their *jhums* in 1909, partly from seed distributed through the local Mauzadars and partly from seed saved from the crop of 1908. The crop grew well and gave fair to good yields, but the men are not yet able to say whether the new cotton will pay them better than the coarse varieties which they have grown hitherto. Many persons sowed *Buri* cotton again towards the close of the year and probably they will be able to pronounce definitely on its merits when the crop now on the ground is harvested. The *Buri* cotton produced last season (1909) was of a decidedly better quality than the indigenous kind, but owing to its novelty and the small amount produced, the growers were unable to obtain a higher price for it than for local cotton. If the present crop prove successful, the Department will assist the cultivators in obtaining proper value for the produce. It is reported that from the *Buri* cotton seed supplied to the Lushai Hills last year (1909) a Lushai chief succeeded in getting a fair amount of cotton. More seed has been distributed among the Lushais this year. Major Cole thinks that *Buri* cotton can be grown in the Lushai Hills. Experiments were made on the Chittagong Khas Mahal Farm with two varieties of cotton, *viz.*, Dharwar American and *Burikanas*. The Dharwar variety yielded at the rate of 64 seers per acre and *Buri* 42 seers per acre. The crops were severely damaged by insects; otherwise larger yields might have been obtained. Mr Hector examined samples of these cottons and considered them to be of good quality and superior to the cotton produced in the Garo Hills.

Mr. G. A. Gammie, Imperial Cotton Specialist, visited this Province in October 1909, and in company with Mr. Hector, Economic Botanist, held an enquiry into the cultivation of cotton in the Garo Hills and the Chittagong Hill Tracts. The recommendations made by Mr. Gammie for the improvement of cotton in these places are that (i) no alteration should be made in the type of cotton grown, as the experience of generations has taught that it is the only variety capable of growing under the conditions of excessive rainfall and primitive methods of agriculture of the hill tracts, (ii) any selection to be done should be undertaken with the view of increasing the length of the staple and the percentage of cotton to seed and not with the idea of modifying the special characteristics of the product, (iii) Garo Hills cotton should be experimentally introduced into all the other hill tracts so that it can pass under the judgement of local cultivators, (iv) Chittagong cotton should be tried on a small scale in the Garo Hills to find out whether the change of locality will affect it as regards the size of boll and quantity and quality of produce. Following the above recommendations arrangements are being made for the cultivation of Garo Hills cotton in the Chittagong Hill Tracts in the next cotton season. Further work in the directions suggested by Mr. Gammie will not be possible until the supervising staff of the Department is strengthened.

Jute.

26. The experiments with jute started in Chittagong in 1908, have progressed so far as to show that jute can be grown successfully there on high lands. The experiment was repeated during the past season (1910). The crop germinated well and looked promising in the beginning, but a long drought succeeding and the seed being that of an early race the plants

matured too soon and the experiment proved a failure. It is proposed to repeat the experiments next season with a later race of jute.

An enquiry was made during the year to ascertain whether the experiments made by some raiyats of village Fulbari in the Bogra district in the use of bonedust as a manure for jute had led to any increased use of this manure in the neighbourhood. The Collector reports that its use is at present limited to a single raiyat who has been using it on his jute fields for five years past. The cultivators, it is reported, are prepared to use it if they can get it cheap. An effort will be made to bring this manure within the reach of the cultivators of the locality in order to encourage them to use it.

Potatoes.

27. The Superintendent of the Dacca Seed Depôt was sent to Calcutta in September 1909 to purchase Nainital and Darjeeling potatoes for distribution in the Province. About 120 maunds of each variety of seed were purchased and supplied direct from Calcutta. The total number of persons supplied was 33. Among the recipients were the Managers of several Government, Wards and private estates who distributed the seed potatoes they received among their respective tenants. The results of the cultivation of the seed varied greatly. In some places very satisfactory outturns were obtained and in others the crop failed either for want of good cultivation and care or from the unsuitability of the soil.

The experimental cultivation of potatoes in the Lushai Hills is reported to be making good progress. Local seed of which 120 maunds was planted in the spring of 1909 did very well and produced a crop of 1,191 maunds. Some of the returns were unusually good. In one large field on the top of Sailam Hill, 18 maunds 5 seers of Nainital and Khasi seed gave 450 maunds. In another case at Champai a Lushai got 10 maunds from 10 seers of seed. This Department supplied in the spring of 1909 190 maunds of seed, of which 50 were sown at Lungleh and 109 at Aijal, 31 being stored for the winter sowing. The seed was received late and not planted until after the middle of May (1909); the results were poor on this account, and the total crop from this amounted to about 500 maunds, of which 182 maunds were produced in the Lungleh subdivision. The total summer crop was therefore between 1,600 and 1,700 maunds. No record is available of the winter crop (1909-1910) which is always small and generally confined to the raising of seed for the following spring. Nearly 500 maunds of seed were sown in April 1910. It was expected that the crop harvested in July would produce not less than 3,000 to 4,000 maunds. It is quite possible that from 1911 a limited export trade will commence.

Sugarcane.

28. The present Manager of the Jalpur Government Estates in Bogra reports that the results of the experiments made by his predecessor with Dacca Ganderi sugarcane were satisfactory. This variety of cane is also being tried by Babu Lalit Mohan Dutt, Agricultural Associate, on his farm near Dhubri. The crop is still on the ground and is reported to be doing well. Some sugarcane cuttings obtained from the Dacca Seed Depôt have been planted in the garden of the Baikunthapur Ward's Estate in Jalpaiguri and the result is expected to be satisfactory. One three-roller iron mill and one shallow pan are also reported to have been purchased by the Manager for the manufacture of *gur*.

An interesting experiment was made during the year by Srijut Debeswar Gossain, Agricultural Associate, on his sugarcane farm at Barpathar in the Sibsagar district. He wished to ascertain if old exhausted forest clearings which have been abandoned after growing sugarcane for two or three years in succession can be profitably cultivated with sugarcane again with the help of manure. A piece of old forest clearing, measuring two-thirds of an acre, was selected for the experiment. It was hoed and manured with the refuse of the *dhaincha* crop and also with 240 maunds of cowdung. The cane was planted in April 1909 and harvested a year later. The total yield of *rab* amounted to 42 maunds 35 seers 5 chattacks, which, on being treated in a centrifugal machine, yielded 16 maunds 17 seers 8 chattacks of sugar and 21 maunds 14 seers of *gur*. These on being sold fetched a gross income of Rs. 228-7. The total cost of cultivation and manufacture, excluding the price of cowdung and charges for the wear and tear of the machinery, amounted to Rs. 74-14-11. Thus a net profit of Rs. 153-8-1 was gained from this cultivation. The supply of cowdung manure being limited, Srijut Debeswar Gossian has started a new series of experiments to find out if oilcake or Sulphate of Ammonia can be profitably used instead. The results of these experiments will be reported next year.

29. In regard to the experiments in terraced cultivation started at Mokokchang in the Naga Hills in 1908, the Deputy Commissioner reports as follows :—"The experimental wet cultivation at Mokokchang, *Nankam* and *Auchakalimi* was successful and the outturn, some 35 maunds an acre, is satisfactory. This outturn is much more per acre than the outturn from *jhum* land. The work of cutting out the terraced fields at first is heavy, and for this reason the people are not so keen on taking it up. The Subdivisional Officer reports that during the last two years the village of Mokokchang has suffered from an epidemic of fever and many people have died, and the villagers attribute this fever to the introduction of the wet cultivation. The cultivation is situated a long way from the village and cannot possibly affect the health of the people. It will take time to get rid of the Naga's prejudice to anything new. In the same village of Auchakalimi the people are said to be keen on extending the cultivation. A start is being made also at Tamlu and Chingaki. The two bullocks purchased for this cultivation have worked well. Mr. Dundas' transfer was a great loss to the subdivision, and it is solely due to his energy and influence with the people that the experiment has been so far successful. One of the bullocks mentioned above has since died and the present Subdivisional Officer of Mokokchang, Mr. J. Needham, doubts if any Nagas would keep bullocks for ploughing purposes. Mr. Needham has received applications from certain villagers to show them how to make terraces. A start will be made in those villages during the ensuing cold weather.

Rice.

It is reported that the wet rice cultivation in the Champai and North Vanlaiphai Valleys in the Lushai Hills has been rapidly extending and similar cultivation has commenced in the Tenzol Valley. The desire for permanent cultivation has brought to light a considerable area of land suitable for irrigation especially on the banks of the Tyao and Mat rivers.

A number of the Bogra Agricultural Association made an experiment with Bakarganj *Balam* paddy on two *bighas* of land and obtained an outturn of 5 maunds of grain per *bigha*.

Several varieties of rice which had been obtained from the Dacca Seed Depôt were grown last year by Babu Lalit Mohan Dutt, an Associate of this Department, on his farm near Dhubri. Among these, two fine scented varieties named *Manikimadhuri* and *Gobindbhog*, a middling variety named *Chaplas*, and a coarse variety called *Hatisali* did extremely well. The *Hatisali* variety gave a particularly heavy yield. It is strong in the stalk and stands erect and is therefore immune from the attacks of rats and mice. The neighbouring raiyats who saw this rice in the field took such a fancy to it that they took the whole of the outturn for seed.

During the last season (1909) the use of bonemeal in combination with saltpetre as manure for wet land rice was demonstrated in 15 different villages in the Khasi Hills and the results on the whole were satisfactory. The total area of the manured and unmanured plots selected for the purpose were 2·36 and 2·22 acres, respectively. The manured plots were treated with three maunds of bonemeal and 30 seers of saltpetre per acre. It is probable that the saltpetre was washed out, as the fields were full of water when it was applied. The average outturn per acre in the case of the manured plots was about 17 maunds of grain and 20 maunds of straw as compared with 10 maunds of grain and 13 maunds of straw per acre obtained from the unmanured plots. The increase in grain alone was nearly 7 maunds per acre, which valued at Rs. 3 per maund would more than cover the price of 3 maunds of bonemeal and 30 seers of saltpetre at Rs. 4-4-0 and Rs. 9-0-0 per maund, respectively. If the price of saltpetre which was possibly washed out and therefore had but little effect on the crop be excluded, the margin of profit would be considerably increased. The effect of bonemeal is expected to last for some years. Certain plots which had been manured with bonemeal in 1908 were found in the following year to give increased yields of grain and straw as compared with the control areas which had been left unmanured. The experiment with bonemeal is being continued in the present season (1910). As a result of these demonstrations Khasia cultivators are beginning to appreciate the usefulness of bonemeal as a manure for the winter rice crop. A few men purchased bonemeal from the Upper Shillong Farm during the year and several others are reported to have prepared a coarse kind of bonemeal at their own homes. Several new varieties of rice are being tried in the Khasi Hills ; the results of these trials will be reported in due course. A full account of the demonstrations and experiments with winter rice in the Khasi Hills will be found in the annual report of the Upper Shillong Farm published separately.

Insect pests are reported to have damaged the rice crop in several parts of the Province. In cases where timely intimation was received instructions as to the remedies to be adopted were issued. The Entomological Collector visited several places from which outbreaks were reported and gave advice.

Orange cultivation.

30. The experiment in budding oranges on various citrus stocks is being continued on the Government Tropical Plantation at Wahjain and in a small garden leased by Government at Umlong, but has not met with much success. The object of this experiment is to produce plants which may prove immune to the orange disease which has prevailed for some years in the Khasi Hills, and also to study the effect of the various stocks on the scions. The other experiments started two years ago with the object of finding some means of combating the disease have not produced results of any value. These experiments consisted of cutting off the connection between healthy and unhealthy trees by means of trenches and of liming the soil at the base of the diseased trees. The first experiment has totally failed to prevent the spread of the disease to healthy plants. In the second experiment the limed trees appear in a healthier condition than the untreated tree, but this may be due simply to the manurial effect of the lime and not to the checking of the disease. This last experiment will have to be conducted on a larger scale and for a considerable period of time before the method can be definitely recommended.

Major Cole did considerable work in the Lushai Hills in distributing orange plants. Some 13,000 plants were obtained from the Khasi Hills, of which about 9,000 survived. Most of these are ready for distribution.

Other crops.

31. Wheat, oats and barley were tried in the Lushai Hills. Wheat succeeded well in certain villages near Champai and to a moderate extent at Aijal, but in nearly every instance the crop were damaged by wild animals or rats. Oats were a failure. One or two sowings of barley are well reported on. A variety of pulse known as "Behliang" in the Lushai Hills is reported to have given good yields during the year. This crop grows vigorously at Aijal and the plants attain a girth of 9″ to 12″ in their third or fourth year. It is very similar to *arhar*, but takes a longer time to cook. It is reported that the Assam Plantation Company at Baroma in the Kamrup district were successful in growing 50 bighas of wheat. Barley and oats were also grown with satisfactory results.

The experiment in growing Mahua trees in the Chittagong Khas Mahal Farm has not been very successful. It is reported that out of the seed supplied in 1908, twenty-five plants were grown, and of these 3 plants only are now surviving. The officer in charge of the farm ascribes the death of the rest to excessive cutting of the roots at the time of transplantation. Some fresh seed has been supplied to the farm towards the close of the year. Experiments with Mahua have also been commenced at Haflong and in the Dacca Farm. For the purpose some seed and living plants have been obtained from the Bengal Agricultural Department.

Spraying demonstrations.

32. The work of demonstrating certain agricultural improvements on cultivator's holdings in the Khasi Hills was continued during the year on a somewhat larger scale than in the previous year. The demonstrations were conducted by two temporary Khasia fieldmen under the direct supervision of the Superintendent, Khasi Hill Stations. The demonstrations made during the year were (*i*) the use of Bordeaux mixture as a preventive of potato disease, (*ii*) the use of bonemeal and saltpetre as manure for winter rice, and (*iii*) the grafting of fruit trees.

During the summer of 1910, seventeen field demonstrations were organised in fourteen villages with the spraying of potatoes with Bordeaux mixture. The crop in one field was destroyed by flood, and in another the control plot which was left unsprayed for purpose of comparison was so small as compared with the plot that was sprayed that the results obtained could not be accepted as reliable. The fifteen plots which were sprayed had an aggregate area of 4·06 acres; and the total area of the fifteen control plots which were left unsprayed was 3·57 acres. Most of the sprayed plots received two sprayings with Bordeaux mixture during the year; two plots were sprayed only once. The mixture was applied at the rate of 240 gallons, costing Rs. 17-8-0 per acre. The season proved exceedingly wet, and there was scarcely any interval of fine weather sufficiently long to permit of spraying being used to the best advantage or of the mixture remaining long enough on the plants to exercise its full effect. The result was that the sprayed plots failed to show such a decided increase in yield of potatoes over the unsprayed ones as was obtained in previous demonstrations. In seven out of the fifteen demonstrations, the sprayed plots gave an increase in

yield of 10 maunds or over per acre. In these cases the spraying which cost Rs. 17-8 per acre left a net profit. In five demonstrations the increase in yield was less than 10 maunds per acre, and in three the outturn of potatoes from the sprayed plots was less than from the control areas. During the year nine Khasia raiyats purchased copper sulphate (the chief ingredient of Bordeaux mixture) from the Upper Shillong Farm, and one man purchased a hand sprayer for use in his potato field.

An account of the other two demonstrations will be found in paragraphs 29 and 33 of this report.

Grafting.

33. The grafting of fruit trees in the villages in the Khasi Hills has been making good progress. No record has been kept of the grafts made prior to June 1910. From the 13th June to the end of August 1910 the two fieldmen have made a total of 285 grafts, of which 171 were pears, 25 apples, 32 peaches, 39 nectarines, 14 plums and 4 apricots. An examination of the grafts will be made next spring to ascertain how many of them have proved successful. While making the grafts, the fieldmen instructed the owners of the trees in the art of grafting. Much good is likely to result from this instruction.

CHAPTER IV.

OPERATIONS FOR THE IMPROVEMENT OF AGRICULTURAL LIVE-STOCK.

34. The measures taken for the improvement of the local breeds of cattle and sheep are described in the annual reports of the Veterinary Department and of the Upper Shillong Experiment Station both published separately.

Poultry.

35. The poultry breeding operations initiated at the Fruit Experiment Station, Shillong, in 1908 proved a failure owing to the want of regular expert supervision. Orders of Government were obtained during the year to abandon the experiment and to limit poultry breeding for the present to the Central Farm at Dacca, where Mr. Meggitt's personal supervision would be available. The poultry breeding work at Dacca was commenced in December last. Three runs and a large paddock behind them, covering in all some three acres of land, have been made, and fitted up with the requisite number of roosting sheds. The runs and paddock have been planted with quick growing trees to afford shade. Two more large runs together with a paddock behind are in course of construction. In March last, one pen of black Langshans and 2 pens of pure Chittagongs were purchased and arranged as follows :—(1) One breeding pen of pure black Langshans, (2) one breeding pen of pure Chittagongs, and (3) one pen composed of a black Langshan cock with Chittagong hens for covering purposes. The birds did not lay well during the hot weather, but the eggs obtained were hatched in order to see whether chickens hatched so late would successfully weather the rains. As apprehended, the early rains proved too much for them, and out of some 30 odd chickens only 8 survived. Mr. Meggitt thinks that all hatching work must be completed by the end of March. Two Langshan birds died of heat apoplexy during the hot weather, otherwise the general health and condition of the birds was satisfactory. The Chittagongs appear to be more robust and better able to withstand heat.

The following account is taken from Major Cole's report on the poultry breeding operations in the Lushai Hills for the year ending 31st March 1910.

"An epidemic cholera in October carried off practically all the new stock raised for breeding, otherwise the year would have been more successful. The stock at present consists of about 450 birds including chickens, mostly Chittagongs, with some Buff Langshans and Buff Orphingtons and a few Indian games and Brahma Langshans; the latter are being disposed of. Four thousand eight hundred and ten eggs were obtained, of which 2,982 were sold to Lushais at 2 annas each and the remainder put to hatch or exchanged for unfertiles, etc. The mortality among young stock during the rains is very heavy, and of 890 chicks hatched, 560 died. Ten villages of 521 houses in addition to nearly all the rest household have now got nothing but imported cocks. The total number of pure imported stock in the district is just under 4,000 and the half-bred stock must be 2 or 3 times that number. The total expenditure on the farm was Rs. 1,859 of which the following items may be taken as recurring :—Pay and allowances of establishments Rs. 480, feeding and medicines Rs. 500, renewal of stock 200, repairs Rs. 120, total Rs. 1,300. The balance is capital expenditure. Against this the receipts were Rs. 606 against Rs. 120 last year. Egg distribution is also going on from the villages first supplied. Khamliana (a Lushai Chief) has sold over 80 sittings of eggs at Re. 1 each, the result of 17 rupees worth of eggs purchased

in 1908. Experience has shown that of all the breeds the Chittagongs are most satisfactory. Langshans and Orpingtons while good layers are delicate and more liable to disease and local conditions are such that only robust hardy birds can survive. But the Chittagong breed is capable of improvement by crossing with the above kinds".

CHAPTER V.

Sericultural Operations.

Operation in the Rajshahi Division.

36. The Central Nursery at Mirganj commenced rearing work at Mirganj in March last. The nursery contains about 60 bighas of mulberry land, and has been equipped with three rearing houses, one seed-house, besides quarters for the staff, and office building and a godown. The operations having commenced late, very little actual rearing work was accomplished during the year. A small crop of Nistari cocoons was raised and supplied to rearers in June last as seed for the August *bund*. Some experiments were made with *Var* seed newly imported from France and with a cross between French and Japanese worms, of which the seed was obtained from France through Messrs. Anderson Wright & Co., and also with a cross between French and Nistari worms produced at Mirganj. The results of these experiments have been exceptionally good considering that all these worms were raised on the Bengal mulberry leaf.

There are two other nurseries in the Rajshahi district, *viz.*, one at Baneswar and the other at Kharkhari. During the year three crops were raised in the former and two in the latter. The total expenditure of the two nurseries amounted during the year to Rs. 550 and the total receipts from the sale of cocoons to Rs. 623-14-0. The control of these nurseries was taken over by this Department in 1908 from the Bengal Silk Committee along with other sericultural operations in the Rajshahi Division. As it was difficult to ascertain the terms and conditions of the tenures on which the lands belonging to these nurseries are held, I submitted a proposal to Government to acquire these lands. Orders have recently been received sanctioning the proposal.

The Superintendent and his staff did some work during the year in the way of instructing village rearers in their own homes in the methods of disinfecting their rearing houses, without which the use of disease-free seed would be of little avail.

The Department was unable to pay much attention to the improvement of sericulture in Malda and Bogra. As things get more into shape, attempts will be made to extend our operations to these two districts. The two sericultural classes at Jote-Arapur and Sujapur in the Malda district which have existed for some years have been reported to be not doing well. The Sericultural Superintendent has made an enquiry in Malda as to the necessity for retaining these classes or other measures to encourage the sericultural industry in that district. His report has just been received and is being considered. The sericultural operations in Bogra continued to be managed by the Bogra District Board with the help of two Sub-Overseers.

The report furnished by the Sericultural Superintendent is printed as Appendix IV to this report.

As a result of two visits to the scene of our sericultural operations in Rajshahi, I have begun to doubt whether our attempt to revive the silk industry in those parts is proceeding on right lines. It seems to me that some good expert advise is required, and I have accordingly written to Mr. Lefroy, the Imperial Entomologist at Pusa, who is a specialist in silkworm rearing, and he has agreed to pay a visit to the districts of Bogra, Rajshahi and Malda next cold weather and advise me as to the best methods to adopt to attain our object.

Rajshahi Sericultural School.

37. This institution which is mainly intended for the training of the sons of silkworm rearers came under the direct management of Government from 1st January 1907. In January 1909, ten students joined the school, out of whom nine presented themselves at the final examination held in January 1910. Out of these four only passed including one local stipendiary and one stipendiary from the Khasi Hills and two private students who held no stipends. The local stipendiary has been paid Rs. 100, a part of the money grant of Rs. 250 which he has earned on passing the examination, and the balance will be paid to him later. The case of the Khasia scholar is noted in paragraph 38.

Some of the passed students of previous years who received each a grant of Rs. 250 for building a rearing house were found on enquiry to have spent the whole

or a portion of it for purposes other than those which were stipulated or have constructed rearing houses contrary to approved methods. They have been asked to comply with the terms of the agreement or to refund the grants made to them. In view of the above facts it has been decided that henceforth the whole grant of Rs. 250 instead of being paid in a lump should be given in two instalments, one of Rs. 100 to commence with, and the balance (Rs. 150) together with a microscope, on the completion of the rearing house.

During the current session of the school which commenced in January last, altogether nine paid apprentices including one Government stipendiary from the Khasi Hills were admitted to the school. A student sent by the Tippera State was also admitted. He received no stipend from Government.

During the year four crops of cocoons were raised in the school. A portion of the produce was sold as seed and the remainder was sold to the local industrial school for reeling. By repeated selection, the *deshi* worms reared in the school have become completely free from *Pebrine*. The Secretary of the school reports that the school seed is gaining in popularity and is readily bought up by village rearers of the Rajshahi and Malda districts.

The school still remains without a competent headmaster. A new man was appointed towards the close of the year. He is still on probation.

The total receipts of the school including the sale proceeds of cocoons amounted to 274-4 during the year under report and the total expenditure to Rs. 2,183-3-1.

Operations in the Khasi Hills.

38. European silkworms were reared for the seventh time at the Fruit Experiment Station, Shillong, last spring (1910), but the result on the whole was somewhat disappointing owing to the carelessness of the man who was placed in charge. A full account of the experiments will be found in the annual report of the Fruit Experiment Station published separately.

Two Khasi youths who were sent to the Rajshahi Sericultural School with stipends in 1908 and 1909 have returned after receiving a full course of training and a third was sent for training in January last. The first two men have not been able to do any rearing as yet, their mulberry plantations not being old enough for plucking. The usual money grant of Rs. 250 will not be paid to these men until they are able to commence rearing.

CHAPTER VI.

Development of other industries connected with Agriculture.

Handloom weaving.

39. The improvement of handloom weaving continued to engage the attention of this Department during the year. The proposal made in the preceding year to send an expert weaver from Dacca to Ludhiana for a course of training at the Salvation Army Weaving Factory was abandoned, as the man selected for the training considered the stipend offered to him inadequate. In January 1910, the services of a weaving instructor were temporarily secured through the courtesy of the authorities of the Salvation Army. The instructor Mr. Narayan Pillay worked at the Dhubri exhibition for about a month. From the 20th February 1910 his services were lent temporarily to the Registrar, Co-operative Credit Societies, who employed him to teach the use of improved looms and improved methods of weaving to members of a Co-operative Association of Weavers at Bharenga in the Pabna district. The instructor began by demonstrating the use of the Salvation Army loom, but he had soon to change his course, the weavers having showed little interest in the demonstration in consideration of the costliness of the loom and the dexterity and labour required in its working. His next endeavour was to introduce certain improvements in the ordinary fly-shuttle looms to which the weavers were accustomed, and in this attempt he appears to have been very successful. He prepared many new accessories locally and succeeded in persuading the weavers to adopt them. The Bharenga weavers are reported to have derived great benefit from Mr. Pillay's instruction. They have learnt to weave twills and drills and the process of weaving ordinary plain cloth also has been greatly improved. The instructor worked at Bharenga till the 16th May when his services were lent for a month to the Manipur State in order to demonstrate before the local weavers the use of the Salvation Army loom. The Manipur Darbar have been extremely pleased with his work and at their request the term of his employment in that State has been extended by one month more. In view of the success that has attended Mr. Pillay's work I have arranged with the permission of Government to retain his services for a further period of one year after his return from Manipur.

The use of the Serampur fly-shuttle loom is extending slowly in the Pabna and Faridpur districts. As reported last year the North Sylhet Local Board has entertained a peripatetic teacher for some time to impart instruction in the use of the fly-shuttle handloom. The instruction given by him has met with some success, as many of the weavers have bought looms of their own.

Serampur weaving institute.

40. A Government weaving school has been established at Serampur in Bengal, and it has been arranged with the Government of Bengal that, pending the establishment of a Central Industrial Institute at Dacca, the Government of Eastern Bengal and Assam will make an annual contribution towards the maintenance of that institution, in consideration of the training of students from this Province.

During the year ten scholarships of Rs. 15 per month tenable for two years in the upper class of the institute were offered, but only two suitable candidates were secured and sent. One student is reported to have made good progress in his studies and the other has resigned the scholarship owing to ill health.

CHAPTER VII.

Agricultural Education.

Nature study in public schools.

41. The main scheme for imparting training to teachers of primary schools in nature study has not been initiated yet owing to difficulties regarding the choice of an instructor and his training. Considerable advance has, however, been made by the Education Department in introducing nature study in primary schools. The measures taken to this end were (i) distribution of grants to schools for gardens, (ii) supply of seed for school gardens, (iii) wider prescription of Messrs. Basu and Majid's Readers, which contain lessons on nature study, (iv) supply of simple apparatus for the illustration of such lessons to schools in Assam, (v) framing of a curriculum in which nature study has been emphasised, and (vi) preparation of Manuals of Nature Lessons.

Deputation of students to Poona Agricultural College.

42. Two of the three students sent to the Poona Agricultural College in 1907 passed the final examination of that college in April 1910. They have since been sent to Pusa to undergo a two years' post-graduate course in Agriculture. The third boy who failed to pass the examination of the 2nd-year class in 1909 was allowed to continue his studies and obtained promotion to the third-year class together with another stipendiary who was sent in 1908. The two stipendiaries sent in 1909 have completed their first year's course. One of them named Santi Prasad Sen has also passed the first year's examination of the Bombay University and has been well reported on by Dr. Mann. For want of suitable candidates no student was sent to Poona during the year under review. The Department continues to remain indebted to Dr. Mann for the kind interest he has been taking in the welfare and progress of the students from this Province.

Practical training at Pusa.

43. The authorities of the Pusa College have arranged for the training of village youths and the subordinate staff of the Agricultural Department in certain special branches of Agriculture, namely, (i) cattle breeding and management, (ii) poultry management, (iii) dairying, (iv) tillage implements and agricultural machinery, (v) fruit growing, (vi) cultivation of *eri* silk, (vii) lac cultivation, and (viii) mulberry silk (*pat*) culture. During the year under report, only one subordinate officer of this Department, namely, Babu Mohini Mohan Ghose, an Overseer of the Dacca Farm, was sent to Pusa for three months to receive training in cattle breeding and management as well as in the principles of construction and the handling of tillage implements and agricultural machinery. The Department did not send any private student for any of these courses of training.

Practical training of sons of cultivators.

44. Under the scheme sanctioned by Government in September 1909 for the employment of apprentices at the Agricultural stations, 4 apprentices are to be appointed annually on the Dacca Farm, 2 apprentices biennially on the Shillong and Jorhat Farms, and one apprentice bienially on the Rajshahi and Burirhat Farms. The allowance fixed for the apprentices in the case of Dacca and Shillong is Rs. 15 per mensem and for all other farms Rs. 10 in the first year and Rs. 12 in the second year. Candidates are selected with sole reference to practical capacity and no higher edu-

cational qualifications are looked for than ability to read and write the vernacular and to cope with simple arithmetic.

At the close of the year there were 8 apprentices employed on the Dacca Farm. All the apprentices are being trained in the laying out of experimental plots, the handling of implements, and the management of cattle and stores. They are made to take an active part in all agricultural operations on the Farm. The senior apprentices are associated in the conduct of agricultural experiments. There were two apprentices employed on the Jorhat Farm and one on the Rajshahi Farm. For want of suitable men the sanctioned posts of two apprentices for Shillong and one for Burirhat remained vacant during the year. The scale of pay for the Burirhat apprentice has proved too low to attract suitable men.

Provincial Agricultural College.

45. The Bengal Agricultural College at Sabour will open in November next. Under the existing arrangements this Province is entitled to send annually to that institution 14 students representing one-third of the expected average yearly admissions. I am in communication with the Director of Agriculture, Bengal, about sending students to Sabour during the ensuing session.

CHAPTER VIII.

Exhibitions and Shows.

Shillong show.

46. The seventh annual show of field and garden produce at Shillong, commonly known as the Shillong Flower Show, was held on the 27th May 1910. The show lasted this year only for one day instead of two days as in the previous two years and the change seemed to be liked by all concerned. The attendance at the show was as good as could be desired. It included a large body of agriculturists from the surrounding country. His Honour the Lieutenant-Governor visited the show and was kind enough to distribute the more important prizes. The number of exhibits registered was 1,449, and included vegetables, flowers, fruits, dairy produce, honey, poultry, cattle, horses, dogs, etc. One hundred and twenty-one money prizes aggregating Rs. 355 were awarded. Among the exhibits, those of potatoes, English vegetables and poultry were particularly good.

Following the example of previous years the use of several types of spraying pump for applying Bordeaux mixture to the potato crop was demonstrated to the Khasia cultivators who came to the show. For this purpose a small area of potatoes had been planted sometime beforehand on the show ground. The method of preparing the mixture from sulphate of copper and lime was also shown and explained to the people. The use and advantages of the Planet Junior Hand-hoes were shown by practical demonstration in the potato plot.

Other agricultural shows.

47. For want of funds no money grants were made to any exhibitions during the year. In some cases the notice given by the Exhibition Committee was so short that the Agricultural Department was unable to take any part in those exhibits. The Department thought it wise to concentrate its attention on the Dhubri Exhibition which had given notice several months beforehand, and it did all it could to promote its success. In April, I addressed a circular to District Officers intimating that the Department will be glad to do its best for any exhibition committee that gives it six months' notice, but that owing to shortness of its resources it will not be possible to undertake to help more than one or two exhibitions in a year. My subordinate staff is so fully occupied at present that I find it almost impossible to spare any of them for undertaking outside work. It is not unlikely that the land on which the Rajshahi Farm is situated will be required for the purposes of the new Godagari-Nator Railway and that the Farm will be abandoned. This will set free one of the Farm Superintendents and will enable me to depute a special officer to work connected with exhibitions. A short account of the exhibitions held at Dhubri and Malda is given below. Exhibitions and shows were also held in several other places, but the Agricultural Department took no part in them.

The agricultural and industrial exhibitionheld at Dhubri in February 1910 was perhaps the largest ever held in this Province. It was opened by His Honour the Lieutenant-Governor on the 3rd February 1910 and remained open till the 15th idem. The exhibition was visited by large crowds of agriculturists from the surrounding country. The Agricultural Department took an active part in the exhibition and con-

tributed a comprehensive collection of the staples of the Province. The most noteworthy exhibits in this section were a collection of nearly 300 varieties of paddy and samples of soybean, sugarcane and potatoes. Mr. Finlow exhibited an interesting collection of fibres including jute of various grades, flax, sida, agave and sunn-hemp. A collection of artificial manures, such as saltpetre, oilcake, etc., was exhibited along with seeds of crops suitable for green manuring, such as *Dhaincha*, sunn-hemp and cowpea. In the Entomological section, the principal insect pests of rice, sugarcane and jute were shown with explanatory notes on the mounted specimens. Several appliances for dealing with insect and fungus pests, *e. g.*, nets and bags for catching insects, fumigating boxes and spraying machines were shown at work. The Fishery Department showed dried specimens of various species of fish found in the Province, fish oils, a collection of interesting nets and traps and live specimens of a fish which feeds on the larvae of the mosquito, and demonstrated the new method of preserving fish in Solling's paper. A number of agricultural and industrial demonstrations were held, some of which were organized by the Agricultural Department and others by the Executive Committee of the exhibition. Among these, the more important were the manufacture of sugar by the Hadi process, the proper method of preserving cowdung in a pit to prevent wastage by rain and sun, the extraction of fibre from flax and plantain trees by simple hand-worked machines, the manufacture of cream and butter with modern machinery and the manufacture of lac. Several new agricultural implements and machines were shown at work, *e.g.*, Harder's winnower, a hand-oil-mill from Messrs. Burn & Co., a rice husker, chaff cutters and several improved types of ploughs. These demonstrations were watched by the visitors with great interest. A demonstration of the Salvation Army and Serampur looms was conducted side by side with that of several kinds of the native handloom. Among the industrial exhibits, special mention might be made of the fine artistic work of the ladies of the higher sections of the community and of the beautiful handiwork peculiar to Mech women inhabiting the frontiers of Bhutan. There was also a large and interesting display of cotton and silk fabrics, including Dacca muslins, metal wares, leather goods, forest goods, furniture, needle and lace work, etc. A full description of the exhibition will be published in the Agricultural Journal of India.

The Malda Exhibition which was held from 15th to 21st February 1910 was the sixth of its kind held at that place. No exhibition had been held in the previous two years on account of the general distress in the district due to failure of crops. An officer of the Department was deputed to attend the exhibition with a part of the agricultural exhibits shown at Dhubri. The agricultural section comprised a collection of the grains produced in the district. Some varieties of sugarcane and maize contributed by the Agricultural Department attracted much attention. Special mention may be made of specimens of cotton, cassava. and a large variety of chilli which were produced in the district. There was besides the usual display of garden produce, fruits and flowers. In the section of flowers much interest appears to have been aroused by collections of button holes, nosegays and wreaths from the gardens of the Maharajas of Kasimbazar and Nasipur. Demonstrations were held of some improved ploughs and hoes and are reported to have attracted much attention. The industrial section contained cotton and silkgoods, embroidery and needle work, essences, soaps, locally made steel trunks, bell metal utensils, ivory article, etc. A Bengali youth lately returned from Japan after a course of training in sericulture exhibited the scientific method of rearing cocoons. The live-stock section contained some fine specimens of bullocks, milchcows and buffaloes.

CHAPTER IX.

COLLECTION AND SUPPLY OF INFORMATION.

Agricultural publications.

48. Only one bulletin and one leaflet were published during the year, namely—

Bulletin No. 22—" Poultry Industry."

Leaflet No. 1 of 1910—A note on the preparation and packing of specimens of plants and insects.

The latter is a reprint from the leaflet issued by the Department of Agriculture, Bengal.

Besides the above the second annual issue of the Year Book of the Department (Krishi Samachar, 1317 B. S.) was published both in English and Bengali and

distributed widely throughout the Province. The first number of the Year Book appears to have met with a good reception from the agricultural public. The second issue was published only a short time ago.

Agricultural statistics, forecasts, etc.

49. The usual preliminary and final forecasts of the various staple crops of the Province, as well as the Agricultural Statistics of the previous year and Season and Crop Report for 1909-1910, were published during the year. Orders are still being awaited on the proposals submitted to Government for recasting the crop forecasts and for modifying the statements embodied in the Season and Crop Report. The usual annual report on tea culture and a supplementary note on "Jute in rotation with paddy in the same year and its effect on food crops" were published during the year.

The Weekly Weather and Crop Reports and the monthly and annual rainfall returns were also prepared and published.

Trade statistics.

50. The quarterly and annual statistics of the trade of the Province carried by rail and river and the monthly and yearly returns of the trade with trans-frontier tribes were as usual compiled in my office. An annual statement showing the import and export trade in selected articles of each district of the Province with Calcutta, Chittagong and the rest of Eastern Bengal and Assam and all other places, was also prepared and published as in the previous year. The Inspector of Trade Registration offices who was appointed in May 1909 to supervise the work of the registration stations did useful work in detecting many inaccuracies in the returns submitted by the Traffic Registrars.

Prices and wages.

51. Fortnightly returns of wholesale and retail prices-current were published as usual. Orders of Government have not been received yet on the scheme for modifying the present system of reporting wholesale prices.

Half-yearly returns showing the prevailing rates of wages in each district for agricultural and other labourers were also prepared and published. The scheme for taking a quinquennial wage census for the Province is still under consideration.

CHAPTER X.

ARBORICULTURE.

52. Mr. R. L. Proudlock of the European Gardeners' Service assumed charge of his duties as Arboricultural Expert in this Province on the 6th July 1909. The principal work done during the year related to the laying out of the residential compounds and the planting of avenues in the new Civil Station of Dacca. The roads and paths of 25 compounds have been aligned and demarcated; the final levelling and dressing have been completed in 9 compounds, while two more are nearing completion. In three compounds the planting has also been completed. Lawn mowing is in regular progress in 8 compounds. The number of trees planted in avenues up to the close of the year was 1,543. Mr. Proudlock visited Calcutta in March for the purpose of making arrangements for obtaining a stock of new plants for the nursery at Dacca. Altogether 9,439 plants and 502 packets of seeds were procured. The nursery was considerably enlarged and two new temporary plant houses and a potting shed were constructed. Mr. Proudlock visited Shillong twice to inspect the Fruit Experimental Station and to advise on the improvement of certain other areas in the town. Since the close of the year, he has submitted a note on the Fruit Station and has suggested certain measures for its improvement. He has also given advice on the improvement of fruit trees in the compounds of the new and old Government Houses at Dacca. He assisted several District and Local Boards with advice regarding arboricultural matters.

The need of fully trained practical assistants for arboricultural and horticultural work has been keenly felt. It is hoped that some of the young men who are now working under Mr. Proudlock will after a year or two become fit to supply this want to some extent.

53. During the year the nursery for ornamental shrubs and plants at Shillong received many new additions and 1,078 plants were distributed from it to 129 persons in and outside the station. The nursery is under the charge of the Superintendent of the Khasi Hills Farms. Mr. Proudlock visited the nursery twice during the year.

54. Seventeen officers from as many District and Local Boards of this Province were sent to attend a class held at the Royal Botanic Garden, Sibpur, for training of subordinate officers in arboriculture. The class was held from 10th August to 9th September 1909. They received both theoretical and practical instruction in the subject from the Curator of the garden. Since the close of the year some of these men have again been sent for a further course of training, and arrangements have also been made for the deputation of a new batch of officers from those Boards which did not send any men last year.

55. A model working scheme for arboricultural operations for the use of the District and Local Boards, which I was asked to prepare, was drawn up and submitted to Government during the year. The scheme is now being amplified with the assistance of Mr. Proudlock.

APPENDIX I.

REPORT ON THE WORK DONE BY THE FIBRE EXPERT.

Transfer of office from Pusa to Dacca.—During the year under review, my office has been transferred from Pusa to permanent headquarters in Dacca.

Experiments with Jute.—Up to the commencement of the present year, the main portion of the work on jute was devoted to a study of the types of plant which are cultivated for the production of fibre. This stage of the work may now be said to have been brought to a conclusion and a short summary will not be out of place. It is of course well known that there are two botanically distinct varieties of jute, *viz.*, *C. capsularis* and *C. olitorius*; but, included under each of these main heads, are a large number of races, which it was necessary to classify and compare. Extensive tours made throughout the jute-growing districts of Bengal and Eastern Bengal by the Reporter on Economic Products to the Government of India and by the writer showed that several types of *C. capsularis*, each of which is generally known by a distinctive name, are cultivated in each district and the result of this preliminary enquiry was that seed of over one hundred races or types was collected and sown in plots at Pusa. It was found, by examination of these plots, that the seed samples of many races were very mixed and that many of the plots contained not one but several types of plant. The races had, therefore, first to be purified by selection before any real comparisons could be made between them. This portion of the work was rendered easier than it might have been, because it was found that, in almost every case, the seed of each type of plant produces plants similar to the parent. This is due, as is shown below, to the fact that jute is normally self-fertilised. Nevertheless, the work required great care; because it was found that the races differ not only in colour, but also in time of maturing; so that a plot which appears quite uniform in the early stages of growth might ultimately prove to be composed of types of plant which differ considerably. After this process of selection had been carried through, it was found that many of the races, although passing under different names in different districts, were, to all intents and purposes, identical and the number of distinct types was ultimately reduced in this way to about 15. This represents the end of the first stage of the work, as a result of which we were placed in possession of fairly pure specimens of practically all the races of jute in Bengal.

The race of *Corchorus capsularis* present three distinct types of colour of stem, *viz*, :—

(*a*) Deep red;
(*b*) Russet red;
(*c*) Green I—(with green fruits);
„ II—(with reddish fruits).

Under each colour-head, there are early and late maturing races. It has been noted that the late maturing races are generally taller than the early maturing ones; so that the former are likely to produce heavier yields of fibre than the latter. All these characteristics are hereditary and we are able, therefore, in distributing seed, to do so with due regard to the conditions under which the crop is to be grown.

Side by side with this field work an investigation of the chemical and microscopical characters of fibre samples obtained from each of the respective races of jute is being carried out, the object being to determine whether or not any one or more of the races could be distinguished from the others as producing fibre of a superior quality. The natural outcome of this portion of the work would be the elaboration of a method of plant to plant selection for the production of a superior race of jute. Such methods, as is well known, have yielded markedly successful results in the case of crops like wheat, sugar, beet, etc. The difficulties which confronted us in this work, however, were considerable, partly because of the fact that the fibre which we wish to examine is a part of the structure of the plant. It is obvious, for instance, that if the plant be destroyed, as is usual, in order to obtain its fibre, no seed could be obtained to sow, in case the examination of the fibre indicated superiority. Such a difficulty does not exist in the selection of sugar beet or of wheat. Another difficulty is that, as far as we can ascertain, excepting cotton, the selection methods for which would not apply in this case, no other work has hitherto been carried out, having for its object the improvement of a fibre crop by selection. The progress has, therefore, necessarily been slow. We have, however, noted small but distinct differences, both chemical and microscopical, and seed from each of the plants examined, the respective fibres of which have shown any indication of superiority, has been sown separately in each case. An examination of the progeny is now about to take place. Whether such differences as these are intrinsic in the plant or whether they are mere accidents of environment for instance, is a matter which only further observation can decide. It remains to be said that the selection work is laborious, depending largely as it does on microscopical measurements. An indication of its nature may be gathered from the fact that, in the selection of about 30 plants, it was necessary, last year, to make something like one hundred thousand actual measurements, under the microscope, of the tiny ultimate filaments, by the spiral twisting together of which the long strand of fibre is produced.

Cross-fertilisation Experiments with Jute.—The first of these interesting experiments, commenced in 1908, have now advanced as far as the 2nd generation of the hybrids. They were designed to throw light on the nature of the origin of the different colour-types of plant, already enumerated, which have come under our notice. It is not necessary to go into details here, but it may be said that the result of crossing a pure green race of jute with a deep red coloured one has been to indicate :—

(1) That all the numerous colour-types of jute plant to be met with in Bengal are either pure types of red or green or the result of cross-breeding between red and green plants.

(2) That the colour of the stem in jute is a hereditary function in the Mendelian sense.

(3) That jute is normally self-fertilised; so that (*a*) an improved race if introduced would not be in serious danger of being speedily swamped by free hybridisation with inferior races, (*b*) In comparing one race with another, it is not necessary to take any special precautions to prevent contamination of the one race with the other.

It may be possible in the future to extend this work in various directions.

Experiments with Jute in the Chittagong District.—These experiments, originally commenced to investigate the possibility of the successful cultivation of jute in Chittagong, have progressed so far as to show that excellent jute can be grown on high lands. More recent experiments have been devoted to utilising the low rice lands for jute in the period between the reaping of one paddy crop and the planting of another. In 1908 sowing in April was unsuccessful owing to water-logging of the land. During the year the land was ploughed in early January, as soon as possible after the paddy crop had been reaped and sowing also took place in January. The crop germinated evenly and looked promising in the middle of April. A long draught followed, however, and the seed being that of an early race, the plants matured prematurely; thus spoiling the crop.

It is proposed to repeat the experiments next season with a latter race; the experiments are not very costly and they are yielding useful information regarding the habit of the jute plant; moreover a successful result would be applicable far outside the Chittagong district.

Experiments with Jute in other Provinces.

Bombay.—In 1909, a crop of jute at Belgaum yielded fibre at the rate of 1,570 lbs. (19·5 maunds) per acre, valued at Rs. 6 per maund. The expense of production was, however, so high as in the opinion of the Deputy Director of Agriculture to preclude the possibility of growing this crop at a profit in Bombay.

Central Provinces.—Jute was grown successfully, with irrigation, last season at both Raipur (Chhattisgarh) and at Telinkheri (Nagpur). This year's crops are also satisfactory and the Deputy Director of Agriculture considers that there is now no difficulty in producing excellent crops of jute at the above Experimental Farms. It is interesting to note that *Corchorus olitorius* seems to thrive better, on the whole, in the Central Provinces, *than Corchorus capsularis.*

Distribution of Jute seed.—During the present season, 70 maunds of jute seeds have been sold and about 20 acres have been put under various races of jute on the Dacca Farm for the production of pure seed to be distributed next year.

"*Heart Damage*" *in Jute.*—It has not been possible during the past year to devote much attention to this problem; and only a few qualitative experiments, with a view to producing "Heart Damage" on a small scale, have been carried out. It is hoped that more time will be available during the coming year for the investigation of the subject.

Flax.

Experiments at Dooriah.—This crop continues to be cultivated at Dooriah, Behar, on a considerable scale; but although nearly 40 acres were devoted to flax in the rabi season of 1909-1910 the experimental stage can hardly yet be said to have been passed. Last year's results, while indicating that the lower lands (dhandhar) are likely to prove most suitable, owing to the better supply of moisture, also tend to emphasize the necessity for high cultivation. Such lands, which had been treated with indigo refuse, yielded an average weight of nearly 54 maunds of excellent straw per acre. On the other hand, from similar land not directly manured, rather less than 30 maunds per acre was obtained. The straw will yield fully 10 per cent. of fibre worth £50, or more, per ton; so that the gross outturn on the manured plot was increased by manuring to the extent of nearly Rs. 60 per acre. Such a result indicates the necessity for careful investigation of the question of manures, and as there is at present no suitable land for the purpose on the Dacca Farm, the Inspector-General of Agriculture in India has kindly offered facilities at Pusa for a comprehensive series of experiments, and has also given his advice in the drawing up of the scheme.

Experiments at Pusa.—The main object of the experiments with flax at Pusa during the season 1909-1910 was to obtain information regarding the yield of straw to be expected from average good soil which had not been specially heavily manured for the crop. The land on which the experiments were carried out was high and rather light in texture; but it was in good condition and owing, to the abnormal monsoon, the soil moisture was fairly good throughout. A yield of nearly 54 maunds of good straw was obtained from one and a half acres, representing 35 maunds per acre. Although this yield is satisfactory, yet the crop showed indications of distress at one time and the conclusion to be drawn is that in an ordinary moisture year good results could not be expected from such high land unless irrigation were resorted to.

Further information was obtained on the subject of acclimatised seed, which indicates that new seed should be imported at least every two or three years if the quality of the fibre produced is to be kept up. As flax seed imported from Europe costs about Rs. 15 to Rs. 20 per maund; preliminary trials have been commenced in some of the cooler Hill Tracts of India with a view to investigating the possibility of surmounting this difficulty. As might be expected no definite information has as yet been obtained; it is necessary first to ascertain the period of the year which is most suitable to the growth of the crop. Definite trials with this end in view are being carried out in Shillong by the Deputy Director of Agriculture and seed has also been sent to Kashmir and to Ootacamund.

The Importation of Flax Seed from Europe.—In last year's report, reference was made to the fact that flax seed cannot be imported safely into India during the hot weather and the rainy season, unless special precautions are taken to dry the seed before despatch and to keep it from

absorbing moisture during transit. Our experience has been that no special precautions are necessary if the seed is despatched from Europe so as to reach India during the cold weather season. The total cost of importation under these conditions is from Rs. 15 to Rs. 20 per maund. If, however, the seed arrives during the hot weather, or in the rainy season, it is necessary to dry it very thoroughly before despatching and also to pack it in hermetically sealed, tin-lined boxes. Otherwise the seed absorbing moisture ferments to such an extent that it refuses to germinate on arrival. A large consignment of flax seed was actually imported in tin-lined boxes during the rainy season a year ago and the bulk of it was good; but its total cost approached Rs. 30 per maund. Such a price for seed means a very serious increase in the working expenses of a crop, the seed rate for which is over one-and-a half maunds per acre.

Flax in Assam.—Mr. H. J. Lawrie, of Baihatta, Kamrup, made a preliminary trial with flax during last season, but although the straw was of good quality, the land on which it was grown was too high and the lack of soil moisture effected the yield adversely. It is hoped to continue the experiments this year under better conditions.

Flax Experiments in other Provinces.

United Provinces.—Last season an excellent crop of flax was grown under irrigation on a demonstration plot at the Agricultural College, Cawnpur. The weight of straw, the quality of which was very good indeed, corresponded to 40 maunds per acre. Further trials are contemplated for the coming season.

Central Provinces.—A small plot of flax was grown last year under irrigation at Hoshangabad and produced straw of fair quality. It is proposed this year to carry out trials on the linseed-growing lands in the Jubbalpore district and also in the Nagpur district.

Extraction of Fibre from Desi Linseed.—Several attempts have been made to extract fibre from the stems of ordinary linseed; but although linseed and flax are botanically identical, the two plants differ so greatly in their natural habits that very little success has hitherto been met with. While the straw of good flax is smooth, unbranched and flexible, the stem of ordinary linseed is generally rough, woody, brittle and often very branched. The fibre which can be extracted from such stems is not only very small in quantity, but it is also so inferior in quality as to be almost worthless. Last year, however, one crop of *desi* linseed grown on heavily manured land under good moisture conditions showed a distinct improvement in the quality of the straw, which weighed nearly 40 maunds per acre, while the seed obtained approached three times the quantity produced by the imported flax. The experiments will be repeated.

Conditions necessary for the successful cultivation of Flax.—The following points in connection with the cultivation of flax are tentatively regarded by the Inspector-General of Agriculture in India, in consultation with Mr. Vanderkerkhove, the Assistant Manager of Dooriah, and the writer, as having been elicited from the experiments so far carried out in India.

(1) Land selected for flax should contain an abundance of moisture both at the time of sowing and throughout the period of growth of the crop. If these conditions cannot be secured by natural means, irrigation may be substituted without detriment.

(2) Lands of the lower type, such as *Dhandhar*, are eminently suitable, both on account of the nature of their soils (stiff loam) and also because the moisture supply is less likely to be precarious. There is, however, no doubt that flax will do well in high lands of good quality, provided the texture is not too light and that a sufficiency of moisture is secured.

(3) Sowing can usually be done successfully between October 20th and November 13th.

It would appear that the crop requires roughly 100 days to mature; so that reaping would take place from about the beginning of February to the beginning of March, according to the date of sowing.

Sunn-Hemp.—During the last two seasons, plots of Sunn-hemp, grown from seed obtained from Pabna and from Chittagong, respectively, have been under observation, and it appears that the two kinds differ very considerably in their cultural characteristics. The Chittagong Sunn, in fact, seems rather to resemble Jubbalpore Hemp, the fibre of which is capable of being used for the manufacture of high class cordage, while that of ordinary Bengal Sunn is not. The Imperial Economic Botanist, Pusa, in an interesting note published a short time ago on this subject, after dealing with other differences between Jubbalpur Hemp and Behar Sunn, such as the taller straighter growth of the former, quotes figures obtained by the writer in support of the superiority of the fibre of Jubbalpur Hemp over that of Behar Sunn.

Other Fibres.—A number of other fibre plants including several varieties of Hibiscus, Sida, etc., are being cultivated on a small scale with a view to collecting information regarding their habits and possibilities for commercial exploitation. At present, none call for any special remark.

I have pleasure in acknowledging the good work done during the year by my Assistant, Mr. G. Srinivasam, and by other members of my staff.

DATED DACCA,
The 5th September 1910.

R. S. FINLOW,
Fibre Expert to the Government of Eastern Bengal and Assam.

APPENDIX II.

List of Honorary Correspondents of the Department of Agriculture in Eastern Bengal and Assam.

Dacca.

1. Rai Hara Sankar Chaudhuri, Teota.
2. Maulvi Abdul Karim Sarker, Post Office Ramnagar, Dacca.

Mymensingh.

3. Babu Chandra Kishore Dey, Sibganj.
4. Babu Iswar Chandra Guha, Jamalpur.
*5. Babu Sarat Chandra Chakrabatti, Gouripur.
6. Babu Bepin Behari Baksi, Kantaliya.

Faridpur.

7. Babu Kali Prosanna Sarkar, Faridpur.
*8. Mr. S. M. Bose, Gopalganj.

Chittagong.

9. Raja Bhuban Mohan Roy, Chittagong.
*10. Babu Iswar Chandra Nandi, Fatehabad, Chittagong.
11. Dwija Das Dutt, Esq., Chittagong.
12. Sadar Khas Tahsildar, Chittagong.

Tippera.

13. Babu Anukul Chandra Roy, Manager, Bhukailash Raj Ward's Estate, Tippera.
14. Babu Ananda Chandra Roy, Zamindar, Gobindapur, Laksham, Assam-Bengal Railway, Noakhali.
15. Babu Abhoya Charan Bose, Naib, Amirabad Zamindari, Chaumahini, Noakhali.

Rajshahi.

16. Babu Kishori Mohan Chaudhuri, Rajshahi.
17. Babu Sarat Chandra Roy, Rajshahi.

Dinajpur.

18. Babu Purna Chandra Sinha, Raiganj, Dinajpur.

Rangpur.

*19. Babu Ashutosh Lahiri, Rangpur.
*20. Babu Rajani Kanta Bhattacharjee, Rangpur.

Bogra.

21. Babu Baidyanath Sanyal, Bogra.
22. Babu Jogendra Nath Sarkar, Bogra.
23. Babu Kashi Nath Das, Bogra.

Pabna.

24. Babu Prasanna Narayan Chaudhuri, Government Pleader, Pabna.

Cachar.

*25. Babu Man Gobind De Chaudhuri, Silchar.
26. F. A. Brownlow, Esq., Kallain Tea Estate, Cachar.

Note.—The names of Agricultural Associates have been marked with asterisks.

Sylhet.

27. Babu Abhaya Kumar Dam, Sadhuhati (South Sylhet).

*28. Babu Basanta Kumar Nandi, Itakhola, Sylhet.

29. D. Ferguson, Esq., Dhamai Tea Estate, Dakshinbhag Post Office, Sylhet.

30. Babu Girija Nath Biswas, Kanairkhal Post Office, Jagannathpur, Sylhet.

31. Babu Har Kissor Gupta, Post Office Pail, Habiganj.

32. Babu Joy Chandra Chaudhuri, Post Office Dwara Bazar, Sunamganj.

*33. The Hon'ble Syed Abdul Majid, Sylhet.

34. Babu Satis Chandra Deb, Karimganj.

35. Babu Pabitra Nath Das, Post Office Beani Bazar, Sylhet.

Khasi and Jaintia Hills.

36. U Rai Mohan Dingdoh, Shillong.

37. U Jones Passah, Jowai.

38. U Job Solomon, Cherrapunjee.

39. U Kubur Singh, Shillong.

Goalpara.

40. Babu Dijes Chandra Chakrabatti, Manager, Gauripur Estate, Goalpara.

*41. Babu Lalit Mohan Dutt, Dhubri.

Kamrup.

42. Rai Saheb Chidananda Chaudhuri, Gauhati.

43. Babu Mahendra Mohan Lahiri, Gauhati.

44. Munshi Tayab Ali, Beltola, Kamrup.

Darrang.

45. Babu Syama Charan Maitra, Tezpur.

Sibsagar.

*46 Babu Akshay Kumar Ghose, Sibsagar.

47. Srijut Debeswar Gossain Barpathar Sugarcane Farm (Goalghat), Badlipar Post Office.

48. D. S. Withers, Esq., Dessai and Parbutia Tea Company, Limited, Moriani, Sibsagar.

Note.—The names of the Agricultural Associates have been marked with asterisks.

APPENDIX III.

Receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1910.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
		Experimental cultivation.	
Sale of manure and Farm produce ...	8,422 8 9	Superintendence	86,931 8 1
Other receipts	3,460 0 0		
		Expert Staff.	
Total receipts	11,882 8 9		
		Fibre expert	18,354 15 3
		Agricultural chemist	17,612 10 0
		Economic Botanist	10,684 2 2
		Experimental Farms.	
		Dacca Farm	89,384 9 0
		Burirhat Farm	11,838 6 9
		Rajshahi Farm	11,177 2 0
		Jorhat Farm	7,162 15 5
		Upper Shillong Farm and Fruit Experimental Station.	14,708 4 2
		Wahjaia Tropical Plantation ...	1,493 0 2
		Central Seed Depôt	9,747 9 3
		Total Experimental Farms ...	1,45,510 14 9
		Agricultural Demonstrations and Experiments.	
		Establishment for the revival of silk industry in Rajshahi.	14,005 13 5
		Sericultural School, Rajshahi ...	2,183 3 1
		Sericultural Experiment at Shillong	133 10 3
		Other Agricultural demonstrations and experiments.	
		Other demonstrations	5,426 9 6
		To cost of terraced rice cultivation in Naga Hills.	298 6 0
		Grant to Agricultural Association, Rangpur.	3,000 0 0
		Total Agricultural demonstrations and experiments.	25,107 10 3
		Public exhibitions and fairs.	
		Agricultural and Horticultural Exhibition, other fairs and shows.	1,069 7 3
		To Registration of river-borne traffic	8,326 4 10
		To Registration of railway traffic	1,995 0 0
		To Provincial Statistics.	
		Frontier road-borne traffic ...	587 2 4
		Internal road-borne traffic ...	2,399 9 2
		Rainguage establishments ...	571 4 0
		Total Expenditure ...	3,1 ,640 8 1

APPENDIX IV.

REPORT OF THE SERICULTURAL SUPERINTENDENT.

Introduction.

As stated in the last annual report the control of the Sericultural operations in this province has been assumed by this Department with effect from the 1st April 1908. Since then a considerable amount of preliminary work had to be done to establish the central rearing station at Mirganj and it is satisfactory to note that this station has been in working order since March 1910.

It serves as a central seed depôt for Rajshahi as well as for Malda and Bogra and is useful to the rearers as a reliable depôt for new seed, because imported seed from different rearing localities is more valuable than seed reared at home year after year. At present, the supply of good seed is the main work of the Sericultural Department, but the supervision of the rearing work of the rearers at their own homes and the giving of advice on scientific methods of rearing, disinfecting rearing houses, etc., were also undertaken so far as the limited staff permitted.

Work at Mirganj.

2. The central rearing station at Mirganj comprises about 74 *bighas* of land, of which about 60 *bighas* are under mulberry and the remainder is covered by the staff quarters, office buildings and compounds, a godown, a tank and roads, drains, etc. The mulberry plantation includes, besides the Bengal bush mulberry, some European mulberry trees which have been successfully grown. It is the intention to plant some more trees of the latter variety during the current year also. Rearing work has been started from March 1910 as stated above. Some new experiments were made with seed of (i) French Var originally reared at Shillong, (ii) a cross between French and Japanese brought through Messrs. Anderson, Wright & Co. from France, and (iii) a cross between the French Var and the country (Nistari) worm bred at Mirganj. The results have been so far exceptionally good, considering that all the experiments were conducted upon Bengal mulberry.

The following results have been obtained from these experiments :—

(*a*) 8 *pons* or 640 green cocoons of French Var weighed one seer as against 16 or 18 *pons* of Nistari cocoons.

(*b*) On being reeled at the Kajla Filature one seer dry cocoons of French Var produced 2·9 chattaks of silk as against 8 chattaks of silk from the same weight of country (Nistari) cocoons, that is to say, that the weight of raw silk from French Var cocoons was $3\frac{1}{2}$ times greater than that of Nistari cocoons of the same quality.

(*c*) One seer dry cocoons of the European cross of French and Japanese yielded 2·7 chattaks of silk at the same filature, which is also almost $3\frac{1}{2}$ times greater than from Nistari cocoons.

The cross between French Var and Nistari would, if reeled, have possibly given the same results, because the quantity of green cocoons weighing one seer was in this case 580 only or about 60 cocoons less than the French Var. From this it may be inferred that the introduction of European varieties among the rearers might be profitable under proper supervision and advise even if the worms were to be fed on the Bengal mulberry. I am glad to state here that these experiments were largely appreciated by many of the rearers of the locality and there was an eager demand for European seed from some quarters. In view of the results obtained by us the authorities of the Kajla Filature of Messrs. Lowis Payen & Co. also expressed an opinion that the introduction of European varieties amongst the rearers is very desirable in the interests of the revival of the silk industry.

Along with these experiments we also raised some Nistari seed and supplied it to the rearers in June for their August crop. There was also a demand from the rearers for our mulberry, this being preferred to the local plants. We encouraged them by selling mulberry plants at a low price. Since the starting of work at Mirganj in March 1910, the total sale-proceeds from mulberry and seed cocoons amounted to Rs. 442-14.

Two more rearing houses, quarters for the clerk and the travelling overseers, drains for the mulberry plots, several roads, paths and sheds, etc., remain to be constructed at Mirganj.

3. There were three crops at Baneswar and two at Kharkhari. This year more attention was paid to the work of rearers at their homes, as in almost all cases they are ignorant of scientific methods and consequently unable to overcome the difficulties of rearing work and often obtain bad results. It is not sufficient to supply the rearers with pure seed, as their rearing houses are infected with disease. Some attempt was made during the year to teach them proper methods of disinfecting. This instance was much appreciated by rearers, but it is not possible to effect substantial results in this direction unless our staff is strengthened. The main difficulty has been to find competent men to entrust with this class of work. The results obtained by the rearers from our nursery seed have been so far satisfactory.

Work at Baneswar and Kharkhari and the outlying rearing villages.

The total expenditure incurred in the two nurseries for rearing work and cultivation of mulberry was Rs. 550, and the receipts realised from sale-proceeds were Rs. 623-14. A new plot of 1½ bighas at Kharkhari has been brought under mulberry cultivation.

4. As pointed out in paragraph 1, seed is supplied to these districts from the central seed depôt at Mirganj.

Work in Malda and Bogra.

In the previous year there was one student from Malda in the Sericultural School at Rajshahi who is now working at Mirganj. Two more boys from Malda originally trained in the Rajshahi Sericultural School are now working here. The object of having these men specially here is to be more in touch with the needs and wants of the Malda rearers. A proposal to establish 2 nurseries in the district with a view to supplying good seed is under consideration. In Bogra, as before, the control of the Sericultural operations is still in the hands of the District Board of Bogra.

5. The staff as at present sanctioned comprises a Sericultural Superintendent, one clerk, two travelling overseers, eight head rearers, eight under-rearers and a peon. Of these, the posts of 6 head and 6 under-rearers are still vacant. Specially selected boys are being trained for the posts of head rearers and the existing vacancies will be filled in as soon as they are found fit. Some difficulty is also being experienced in inducing people to accept the posts of under-rearers on the present sanctioned pay.

Staff.

6. The total expenditure during the period amounted to Rs. 14,005-13-5 spent under the following heads:—

Expenditure.

	Rs.	a.	p.
Establishment	2,747	3	7
Buildings (original)	5,476	1	1
Reclamation	288	13	0
Roads, drains, fencing	80	4	0
Excavation of tank	387	7	9
Rewards to rearers	30	0	0
Wages of labour	2,520	4	8
Petty repairs	229	3	0
Implements and furniture	1,156	13	9
Manure, seed and plants	348	13	6
Miscellaneous	618	11	10
Stamps and telegrams	54	0	0
Rents, rates and taxes	68	1	3
Total	14,005	13	5

E. B. & A. G. P. (Agri.) No. 67—750—3-11-1910

Resolution on the Report of the Agricultural Department, Eastern Bengal and Assam, for 1909-10.

Extract from the Proceedings of the Lieutenant-Governor of Eastern Bengal and Assam in the Revenue Department, No. 2523R., dated the 31st October 1910.

READ—

The Report of the Department of Agriculture, Eastern Bengal and Assam, for 1909-10.

RESOLUTION.

DURING the year there was some addition to the superior cadre of the Agricultural Department. The requirements of inspection and administration necessitated the appointment of a Second Deputy Director, and at the close of the year the Government of India sanctioned the creation of a permanent post of European Gardener for the Province. The services of the officer lent by the Government of Madras had already proved of great value at Dacca in laying out the new station, and as time and funds permit, improvements will be introduced in the larger towns of the Province. The Entomological and Mycological Collectors completed their course of training during the year and assumed charge of their duties.

2. In spite of these additions the work of the Department continues to be handicapped by the lack of a sufficient staff and of local helpers. Honorary Associates and Correspondents continued to render valuable assistance, and Srijut Debeswar Gossain of Barpathar and Babu Lalit Mohan Dutta of Dhubri in particular have done excellent work, but more whole time and peripatetic officers are required, and Government has under consideration a proposal for the appointment of an Agricultural Officer in each of the more important districts. The *raiyat* is naturally conservative and does not readily adopt new methods, and the demonstrations and advice of a man who is well known to the villagers and has won their confidence will do much to popularize the work of the Department.

3. The extent to which new crops and improved methods were tried—and tried successfully—in the hill districts is noteworthy. This no doubt is partly due to the fact that the local officers have more time to supervise experiments and are in closer personal relations with the people, and partly to the fact that there is so much room for improvement in their low standards of agriculture. In the Lushai Hills, Major Cole was particularly successful in the introduction of improved methods and staples. Wet rice cultivation is rapidly extending; wheat, barley, oats, oranges and cotton have been tried, and potatoes have done so well that it is hoped that an export trade may spring up in 1911. In the Khasi Hills the *raiyats* are beginning to appreciate the use of bonemeal and the Bordeaux Mixture. But it is clear that the chief work of the Department must be amongst the teeming population of the plains, and the dissemination of useful knowledge amongst the *raiyats* must be steadily pushed on. The enquiry into the different types of jute was continued during the year and some experiments were made with rice and potatoes in the plains, but the actual results obtained were small in comparison with those reported from the Hills. The interest of the people still requires awakening, and only 75 natives of the province were supplied with seeds, manures, and implements from the Central Seed Depot during the year.

Attempts were made to increase the area under cotton, and seed was distributed in the Lushai and Mikir Hills. Mr. Gammie, the Imperial Cotton Specialist, visited the province. It is interesting to learn that he advised that no attempt should be made to alter the type of plant grown in the Garo Hills.

4. The young stock in the Shillong herd are full of promise, but difficulty is experienced in obtaining sufficient grazing at this high altitude during the winter months. Government is now considering the question of forming a large herd in the North Cachar Hills with the object of gradually spreading an improved strain throughout

the Province. A start was made with poultry-breeding in Dacca, but the enterprise is still in its infancy. In the Lushai Hills really notable work has been done by Major Cole. There are now upwards of 4,000 pure imported stock in the district and two or three times that number of half-bred fowls. The Lushais readily purchase sittings at 2 annas an egg, and one chief is reported to have made Rs. 80 by selling the eggs of fowls raised from sittings for which he had paid Rs. 17 two years before.

5. The decision of the Dacca Conference of Agricultural Officers to encourage demonstrations and experiments by Associates, Correspondents or selected cultivators by the supply of seeds, manures and implements free or at reduced rates constitutes a considerable step in advance, but progress must continue to be slow till the strength of the Department is increased. An excellent agricultural and industrial exhibition was held at Dhubri, but such exhibitions merely prepare the ground and persistent efforts are required if substantial results are to be obtained.

The success that has attended the demonstration of hand-loom weaving by the Instructor whose services were lent by the Salvation Army authorities especially in Manipur is very gratifying, and His Honour trusts that full advantage will be taken of his services after his return from Manipur to familiarise all parts of the province with his improved methods.

The Report is an interesting record of progress, and the Lieutenant-Governor thanks Mr. Strong and his staff for their efforts to promote the efficiency of the Department and the improvement of agriculture.

ORDERED—That a copy of the Resolution be published in the *Government Gazette* for general information.

ORDERED ALSO—That a copy of the Resolution be forwarded to the Director of Agriculture, Eastern Bengal and Assam, for information.

By order, etc.,

B. C. ALLEN,

Offg. Secretary to the Government of Eastern Bengal and Assam.

E. B. & A. G. P. (P. & G.) No. 253—800+4—31-10-1910.

F. 304:3

REPORT

OF THE

AGRICULTURAL DEPARTMENT,

EASTERN BENGAL AND ASSAM,

FOR THE

Year ending the 30th June 1911.

SHILLONG:
PRINTED AT THE EASTERN BENGAL AND ASSAM SECRETARIAT PRESS.

1911.

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No. 11278.

FROM

S. G. HART, ESQ., I.C.S.,
DIRECTOR, DEPARTMENT OF AGRICULTURE,
EASTERN BENGAL AND ASSAM,

To

THE SECRETARY TO THE GOVERNMENT OF
EASTERN BENGAL AND ASSAM IN THE REVENUE
AND GENERAL DEPARTMENT.

Dated Dacca, the 17th October 1911.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1911.

I have the honour to be,

SIR,

Your most obedient Servant,

S. G. HART,

Director of Agriculture, Eastern Bengal and Assam.

GOVERNMENT OF EASTERN BENGAL AND ASSAM.

AGRICULTURAL DEPARTMENT.

AGRICULTURAL BRANCH.

No. 284Ag.

FROM

THE HON'BLE MR. J. F. GRUNING, I.C.S.,
SECRETARY TO GOVERNMENT,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA, DEPARTMENT OF REVENUE AND AGRICULTURE.

Shillong, the 16th November 1911.

SIR,

IN submitting a copy of the report of the Agricultural Department of Eastern Bengal and Assam for 1910-1911 with 14 spare copies, I am directed to say that Sir Charles Bayley has not thought it necessary to record a formal resolution in view of the detailed memorandum, dated the 17th August 1911, recorded on the eve of his retirement by Sir Lancelot Hare on the work done by the Agricultural Department of Eastern Bengal and Assam during the past five years and the programme for the near future, which has been reproduced in Appendix IV to the report.

2. The Lieutenant-Governor proposes therefore merely to notice the following developments which have occurred since the issue of the memorandum :—

(*a*) *Paragraph* 5 *of the memorandum.*—Orders have been received from the Government of India in Mr. Holme's letter No. 934—219—2, dated the 7th September 1911, sanctioning as an experimental measure for two years, the introduction into two or three selected districts of the Province of the scheme for the formation of a service of district agricultural officers, and measures are being taken to give effect to these orders.

(*b*) *Paragraph* 16 *of the memorandum and the closing sentence of paragraph* 53 *of the report.*—The following orders have now been passed on the recommendations of the Imperial Entomologist for the improvement of Sericulture in the silk-growing areas of Malda, Rajshahi and Bogra :—

(1) His Honour has approved the opening of a new seed station in Malda, as soon as the existing one at Mirganj is working up to its full capacity and also the appointment of a third itinerant overseer for Sericultural work.

(2) The Department will not attempt to experiment with new breeds but will devote special attention to the supply of disease-free seed only.

(3) Action will be taken to encourage the planting of mulberry trees in sericultural localities.

(4) The Director of Agriculture has also been directed to inquire if the services of a European Silk Specialist can be obtained on reasonable terms.

(*c*) *Paragraph* 15 *of the memorandum and paragraph* 50 *of the report.*—An officer has now been selected to take up the special enquiry regarding the cattle survey and will commence work at once.

I have the honour to be,

SIR,

Your most obedient Servant,

J. F. GRUNING,
Secretary to Government.

[Minimum limit of the number of pages of this Report as fixed by Government—18.]

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REPORT

OF THE

AGRICULTURAL DEPARTMENT,

EASTERN BENGAL AND ASSAM,

FOR THE

Year ending the 30th June 1911.

CHAPTER I.

ADMINISTRATION.

1. The Director's office was permanently transferred from Shillong to the Secretariat buildings at Dacca during the Puja vacation of 1910.

Director.

2. The post of Director was held by Mr. F. W. Strong up to the 8th November, when I resumed charge of the Department. During the year Mr. Strong spent 42 days and I 136 days on tour The chief object of the Director's tours were—(i) inspection of agricultural stations and demonstrations, (ii) collection of information in regard to agricultural and economic conditions, and (iii) most important of all, keeping the department in touch with local officers and non-officials who are interested in agricultural development.

First Deputy Director.

3. Up to the 7th June when he took long leave on medical certificate, Rai B. C. Basu Bahadur held the post of First Deputy Director with headquarters at Shillong. He was in charge of the agricultural stations at Shillong, and Burirhat and of a circle comprising the districts of Rangpur, Jalpaiguri, Dinajpur and Malda, and the divisions of the Assam Valley and Surma Valley and Hill Districts. He was on tour for 169 days, chiefly in connection with the work of agricultural stations and visiting and advising honorary assistants of the Department.

Second Deputy Director.

4. Mr. A. G. Birt, B.SC., was on leave for six months from the 6th July 1910, during which time his work was carried on by Messrs. Finlow and Meggitt. On his return he resumed the post of Second Deputy Director with charge of the Dacca, Jorhat, and Rajshahi Agricultural Stations and a circle comprising the Dacca and Chittagong Divisions and the districts of Rajshahi, Pabna and Bogra. During the half year Mr. Birt was on tour for 96 days, the greater part of which was occupied in work connected with the Jorhat agricultural stations. Since Mr. Basu went on leave, Mr. Birt has also undertaken the supervision of Burirhat station.

Fibre Expert.

5. Mr. R. S. Finlow, B.SC., Fibre Expert, was on duty throughout the year and spent 95 days on tour, chiefly in connection with enquiries regarding jute and flax. A full report of Mr. Finlow's work is given in Appendix I.

Agricultural Chemist.

6. Mr. A. A. Meggitt, B.SC., retained his post as Agricultural Chemist during the year. Much progress was made in researches concerning the causes of infertility in soils of the types found at Dacca and Jorhat. Mr. Meggitt was on tour for 101 days, a large portion of which was occupied with work connected with sugarcane at Jorhat. A more complete account of Mr. Meggitt's work will be found in Appendix II.

Economic Botanist.

7. Towards the end of the year Mr. G. P. Hector, M.A., B.SC., was confirmed in the post of Economic Botanist. He was occupied chiefly in preliminary work connected with the study of rice and other important crops of the Province. With the appointment of a laboratory assistant Mr. Hector's sanctioned staff was completed. His report is published as Appendix III.

Agricultural Supervisors.

8. Three appointments of Agricultural Supervisors are sanctioned, but up to the close of the year only one had been filled. Mr. J. N. Chakrabarti, M.S.A., was Agricultural Supervisor in charge of the Dacca Farm up to the 8th March when he went on leave. Returning on the 25th of May he was transferred to Shillong where he is carrying on the duties of the First Deputy Director. During Mr. Chakrabarti's absence Babu Rajesvar Das Gupta officiated as Agricultural Supervisor, Dacca, in addition to his duties as Superintendent of the Seed Depôt.

Entomological Collector.

9. Babu P. C. Sen worked throughout the year as Entomological Collector with headquarters at Dacca under the general supervision of the Deputy Director. The principal items of entomological work done during the year are mentioned in Chapters III and IV. The Collector was on tour for 154 days.

Mycological Collector.

10. From the 5th January 1911, the post of Mycological Collector was raised to the grade of Rs. 50—75. Babu A. L. Som occupied this post during the year, being supervised by the Economic Botanist. The Collector was on tour for 157 days. In addition to the mycological work described in Chapters III and IV, several new species of fungi attacking economic crops and wild plants in this province were identified and representative specimens were placed for reference in the herbaria at Dacca and Pusa. As the new fungi are not responsible for any extensive damage, a list would not be of sufficient general interest for inclusion in this report. Technical descriptions of them have been published by the Imperial Mycologist.

Research laboratory.

11. Some difficulty is being found in regard to the pumping engine for the water installation which cannot be readily adapted to changes of the water level in the well. The petrol vapour and air installation answers excellently for purposes of lighting and heating except for furnace work; this minor difficulty will probably be surmounted and it is satisfactory to find that on the whole the building provides admirably for all the purposes for which it was constructed. In order to study the effect of environment in the quality of jute it has been necessary to add to the laboratory a pot-culture house, where jute is being grown under various strictly defined conditions. A special staff comprising an engineer, mate, and mali was sanctioned for the laboratory from the 1st August 1910, to which a watchman was added at the close of the year. The special staff and the building are under the charge of Mr. Finlow as senior expert officer. A descriptive account of the laboratory was published in the "Dacca Review" for September by Mr. Finlow.

Dacca Agricultural Station.

12. Some further reclamation was done and, out of a total area of some 350 acres, nearly 250 acres are now under cultivation. A device has been introduced to reduce the surface wash from the high land. This consists in making a low bund along the edge of the "taks" or blocks of high land. This has the effect of holding up the surface water sufficiently long to cause the silt to be deposited. A deposit, several inches in depth, is thus formed every year and gradually the surface of the high land is reduced to an uniform level. Quarters for the whole of the farm and laboratory staffs were completed during the year. Three large wells were constructed and a fourth was commenced, which it was hoped would tap artesian water; but, though a tube was driven to a depth of 350 feet, no such spring was discovered. With the re-excavation and dressing of two large tanks, the reclamation work of the farm was practically completed. Owing to the leave and subsequent transfer of Mr. J. N. Chakrabarti, several changes of management had to be made during the year; at present the farm is in the charge of Babu Kali Das Rai, formerly supernumerary Farm Superintendent, which arrangement is intended to be continued permanently.

Rajshahi Agricultural Station.

13. The future of Rajshahi agricultural station is somewhat uncertain. The railway authorities are acquiring about a third of the area and, owing to difficulties in devising an effective scheme of drainage, it is doubtful whether the remainder is worth retaining as an experimental, or even as a demonstration farm. Babu Har Kumar Guha was Superintendent of the Station during the year, except for three months when he was on leave.

Burirhat Agricultural Station.

14. The new buildings erected at Burirhat during the year included quarters for the Farm Superintendent and fieldman clerk and a barn for the fire-curing of tobacco. A pukka tobacco storehouse with fire place and flue is under construction and will shortly be completed. Babu Jamini Kumur Biswas has been Superintendent of this Station since it was started in 1908; to his efforts is due the chief part of the credit for the satisfactory progress made in the cultivation and curing of tobacco.

15. Owing to the large quantities of cane which have to be crushed within a short time it has been necessary to instal at Jorhat agritural station a 3-roller cane mill driven by a 9.-H. P. Hornsby oil-engine. Srijut Bina Ram Das was Superintendent of the station throughout the year.

Jorhat Agricultural Station.

16. The development of cattle-breeding operations at Upper Shillong has made it necessary to send the cattle during the winter to a lower elevation, where sufficient grazing can be found. For this purpose a site has been acquired at Sumer, 14 miles from Shillong, on the Gauhati road and most of the farm cattle were sent there during last winter. The masonry silo on the farm has not been altogether successful, partly owing to the semi-circular shape adopted. Though in ease of construction and accessibility this shape has obvious advantages over a silo of circular section, the pressure developed is less uniform and increased wastage occurs. During the year some improvements were made by deepening and straightening the stream which traverses the farm and a larger area is now available for grazing and cultivation. A scheme is under preparation for completely draining the whole farm and the work will be carried out gradually as funds permit. During the year a store-house with stone floor and walls was constructed. Mr. Herrick Singh has been Superintendent of this station from the time it was opened.

Upper Shillong Agricultural Station.

17. The lack of interest shown by the staff of the fruit station has been due to the fact that proposals have been made for the abandonment of the station. Pending the decision of this question, I have arranged for Mr. Chakrabarti, Agricultural Supervisor, to make this station his headquarters and relieve the Superintendent of Upper Shillong of the responsibility of management, except in the absence of the Supervisor. Schemes have been devised for carrying on the fruit experiments with due provision for shelter for the trees and for confining the work to varieties of crops and methods of cultivation suited to the exacting climatic conditions of Shillong.

Fruit Station.

18. Government has sanctioned a proposal emanating from the Economic Botanist for the abandonment of the Wahjain tropical plantation, as owing to the unsuitability of its soil and climate, most of the tropical plants, which it was hoped to establish, do not thrive there and are not profitable. The experiments in budding oranges on other varieties of citrus have been transferred to the Dacca Farm, where they will be carried on under the supervision of Mr. Hector.

Wahjain Tropical Plantation.

19. The seed depôt at Dacca was under the charge of Babu Rajevsar Das Gupta, who was also entrusted with the duty of organising the agricultural sections of the Comilla and Malda exhibitions and the arrangement of the exhibits sent from this province to the Allahabad Exhibition. For nearly 3 months he also officiated as Agricultural Supervisor in addition to his ordinary duties. The total receipts of the seed depôt during the year were Rs. 2,215-9-3, in addition to which goods to the value of Rs. 556-10 were supplied free to Government officers and Associates and concessions to the value of Rs. 76 were granted to correspondents, for experiments or demonstrations made by themselves.

Central Seed Depôt.

20. The Central Sericultural Station at Mirganj has been developed by the construction of a fourth rearing house and the reclamation and planting of a further area of 8 bighas. The sites occupied by the two sub-stations at Banesvar and Kharkhari are being acquired. Mr. M. M. Chakrabarti continued to be Superintendent of Sericulture throughout the year. His chief duty is the production on a large scale of seed cocoons free from all disease germs. An account of the year's work will be found in Chapter IV.

Sericultural Stations.

21. Babu G. C. Chaudhuri, Sub-Deputy Collector, on special duty, was attached throughout the year to the Director's office, of which he held charge during the Director's absence on tour. Since the close of the year he has reverted to ordinary duty and I take this opportunity to acknowledge the careful and painstaking manner in which he invariably did the work entrusted to him. Though the pressure of work is sometimes heavy and its nature is somewhat specialised and more exacting than routine clerical work, the office staff has worked loyally and well.

Personal Assistant and office staff.

22. The expenditure of the Department during the year ending on the 30th June 1911, amounted to Rs. 2,85,059 and the receipts to Rs. 15,041. The principal heads of expenditure are shown in Appendix VII.

Expenditure and receipts.

CHAPTER II.

Agricultural Education.

Nature study in Primary Schools.

23. A scheme for the training of teachers to give nature study lessons in primary schools has been sanctioned by the Government of India. Dr. Gupta has been appointed to take charge of this work and for the present is attached to the Training College at Dacca.

The Education Department is providing gardens for primary schools and supplying seed for them. A curriculum has been framed in which nature study is emphasised. Messrs. Basu and Majid's Readers, which contain lessons on nature study, are prescribed for the schools in many districts and special manuals of nature lessons are under preparation.

Rajshahi Sericultural School.

24. In the session commencing in January 1910, 11 apprentices were admitted to Rajshahi Sericultural School, of whom 10 were granted stipends: three left during the year and 4 more failed at the half-yearly examination; 4 appeared at the final examination and all passed. Five crops of cocoons were raised during the year, but the total yield was only 475 kahans, which is certainly inadequate. For an essentially practical school, such as this is meant to be, a location in the heart of a town is perhaps unfortunate, as the school is to a large extent out of touch with the practical life interests of the silk-rearing community. Some sericultural classes were formerly attached to middle schools in Malda district; it is under consideration whether these should be revived on the basis of paying the teacher a bonus for each student successfully trained.

Apprentices on Government Farms.

25. In order to obtain men qualified to work as fieldmen-demonstrators, a limited number of apprentices are appointed on the various Agricultural stations. Owing to the paucity of the staff and the pressure of reclamation and engineering work, insufficient attention has been given hitherto to the training of these youths in the details of demonstration work. Detailed instructions have been recently issued which should have the effect of ensuring to each apprentice a complete training in every phase of his future duties and provision is made for the prompt weeding out of those who are found unsuitable.

During the year four apprentices completed their training at Dacca, one at Rajshahi and two at Jorhat. At the close of the year seven remained under training at Dacca and two at Shillong; vacancies will be filled up gradually as suitable candidates are discovered. The apprentices who have completed their training are being employed temporarily as demonstrators on Rs. 20 a month. It is intended that those who prove thoroughly competent will be made permanent in the grade of Rs. 25—40.

Special Short Courses.

26. Two men, Dohleia and U Kishon Roy were sent from the Lushai Hills to Pusa for 9 months' training in fruit culture and lac rearing. Both completed their courses to the satisfaction of the Imperial Economic Botanist and Entomologist, the reports on U Kishon Roy being particularly favourable. The Superintendent of the Lushai Hills is now employing them in introducing and developing lac rearing, the growing of fruit trees, potatoes and other new crops and poultry breeding. Proposals are being submitted to Government for their retention at the school for the sons of Lushai Chiefs where they will conduct a simple course of practical instruction in improved methods of agriculture.

At the request of the Manipur Darbar two Manipuri youths were sent in January last to Gauhati where a demonstration of the Hadi process of sugar making was being carried out on the farm of an Associate of this Department. Having been taught this process they proceeded to Dacca Farm where they were given a further short training in the use of some new agricultural implements.

In July 1910 a mali was obtained from Saharanpur, who after a short training at Dacca under the Arboricultural Expert in methods of fruit culture suited for this province, proceeded to Manipur with a stock of mango, lichi, peach, apricot and other grafts.

Babu Jamini Nath Das Gupta, one of the proprietors of the proposed Dacca Dairy Farm, under an arrangement made by this Department, was given a three months' course in cattle breeding and management from January to April last at Pusa.

Poona College.

27. Two Government scholars of this Province completed their course at Poona Agricultural College in April 1911. Maulvi Fazhul Haq, an Assamese scholar, obtained the diploma in agriculture. The Principal reported highly on his practical ability and recommended that his further training should be carried out at Dacca rather than at Pusa. The Local

Government accepted this proposal and the student is now undergoing a two years course of training under the Deputy Director. Maulvi Abdur Razak, the other Government scholar, failed to pass the final examination; but being well reported on for practical work and general ability has been given, as a special case, an appointment as Overseer at the Dacca Farm. Two more Government scholars will complete their course in April 1912.

Sabour College.

28. The Agricultural College which this province shares with Bengal was opened in November 1910. It was decided that in the first year the number of admissions should be limited to 20, of which 7 were assigned to Eastern Bengal and Assam. Applications were received from 65 candidates from whom 7 were selected by the Director; 4 of these failed to join or left shortly after; substitutes were selected, but only three actually joined. Altogether 6 of our students now remain at the college. It has been decided that in June 1912 fourteen more students from this province will be admitted to the college. As so many applications are received for admission as paying students, it has not appeared necessary to offer scholarships or free-studentships. Unfortunately not a single Muhammadan candidate is forthcomig on these conditions and to encourage them to acquire an agricultural education it will perhaps be necessary to offer a few scholarships to Muhammadans and Assamese.

Post-graduate Training.

29. Two Government scholars of Eastern Bengal, Babus Binod Lal Mukharji and Binod Behari Das, obtained the B. Ag. degree at Poona College in April 1910 and became entitled to a further two years' course of post-graduate study at Pusa in some special branch of agricultural science. The subject chosen for them was general agriculture; but as the Pusa Institute provides no post-graduate course in this subject, they were attached to the Pusa Farm for practical training. It was afterwards realised that a practical training acquired in this province would be of more ultimate utility, and they were withdrawn from Pusa in May last and deputed to Dacca where they will complete the remaining year of their post-graduate training under the supervision of the Deputy Director.

CHAPTER III.

EXPERIMENT AND RESEARCH.

Crops on highland soils of the "old alluvium."

30. The causes of the infertility of highland soils of the "old aluvium" are being studied by the Agricultural Chemist and Deputy Director and fairly definite conclusions can now be announced. Analyses of the soil of Dacca and Jorhat Agricultural Stations disclose an abnormal deficiency of lime. This fact alone goes far to explain why the soil is so unproductive. Its bad physical condition is obvious even to the most superficial observation; though very absorbent, its water-retaining capacity is small; as soon as the rains cease it dries almost to the consistency of a brick and begins to crack; no amount of cultivation will produce a good surface tilth. The addition of lime improves the texture of this soil by facilitating the penetration of air, water and roots. The soil has also been proved to be acid, a condition which is favourable to the growth of fungi and such plants as sedges which are a characteristic feature of the natural herbage of Dacca and Jorhat Farms in the rains, but inimical to the development of the bacteria which convert organic compounds in the soil into plant food as is shown by the fact that peas grown on Dacca Farm have no nodules on their roots, unless heavily manured with cowdung. This acid condition is immediately corrected by the application of lime, and an improvement in the bacteriological condition of the soil is bound to follow. The deficiency of lime is also partly responsible for the bad chemical condition of the soil, for a sufficiency of that substance is required to render available the reserves of plant food present in the soil and to bring into full action any added manures.

When the Dacca Station was first started an experiment was laid down to ascertain whether by constant green manuring the soil could be rendered fertile. After three years' green manuring the experimental plots have not shown any very marked improvement. Last cold weather they produced a small crop of oats whereas none grew on untreated plots. This small improvement was probably due to the green manure having increased the water-retaining capacity of this soil; but owing to bad bacteriological conditions the organic material added has not been converted into plant food.

To test the effect of lime on this soil, several experiments have been made. An "aus" rice field at Dacca was divided into two and to one part lime was applied in 1909 at the rate of 30 maunds per acre. In 1910 the crop from the limed plot weighed 17 maunds per acre, while on the unlimed plot only 11 maunds were obtained. In 1909-10 peas and oats inoculated with nitrobacterine were found to grow better on

limed than on unlimed land. The effect of liming was very marked in experiments carried out at Jorhat, where last cold weather crops of oats and linseed were obtained from limed plots, while the adjacent unlimed plots proved absolutely barren.

Experiments have now been laid down at Dacca and Jorhat to ascertain the rates and intervals of time at which successive applications of lime can be made with the greatest advantage. The experiment at Dacca is in three series, *viz.*, with and without the addition of:—

(i) Green manure.
(ii) Bonemeal.
(iii) Cowdung.

The soil analyses have also brought to light the fact that the soils of which Dacca and Jorhat are types are very deficient in phosphoric acid compounds. The most economical and easily available means by which this deficiency can be met is the application of crushed bones. In experiments carried out during the last three years it has been found that in the damp, warm climate of this province bonemeal comes into solution in the soil water and thus becomes available as plant food much sooner than in England. In fact, in most cases, the increased profit realised from the first crop, harvested a few months after applying bonemeal, is usually more than sufficient to pay the entire cost of the bonemeal and without any further application the manured land continues for two or three years longer to yield larger crops than adjoining unmanured plots.

There remains one other deficiency in these soils, *viz.*, organic matter and nitrogen. The most appropriate means for correcting this defect is green manuring; but, as mentioned above, it is necessary that this should be combined with liming. The best green manuring crop so far found for the highland soil is *dhaincha* which, in a fairly good season, adds over 100 maunds per acre of organic material to the soil and contributes to the store of assimilable nitrogen the innumerable large nodules of bacteria found on all parts of its roots. Experiments are also being made with other leguminous crops, especially for lowland soil on which *dhaincha* sometimes fails to make good growth.

For further information on this subject reference may be made to Appendix II and to the papers by Messrs. Meggitt and Birt mentioned in paragraph 69.

Rice.

31. An experiment in manuring winter paddy was commenced on Dacca Station in 1908 when regulated quantities of various manures were applied to a series of plots; the same manuring was repeated in 1909. The results obtained in those two years demonstrated that bonemeal used alone at the rate of three maunds per acre gave excellent results, but that when soluble manures, such as saltpetre, ammonium sulphate, and calcium nitrate were added, they reduced the profit considerably. In 1910 the same plots were again cropped with winter rice, without further manuring, to ascertain what residual effect the manures applied in 1908 and 1909 would have. The chief result has been to demonstrate the lasting effects of bonemeal. On plots where bonemeal had been applied an average of nearly 5 maunds more grain was obtained than from the unmanured plots. The addition of a soluble manure left absolutely no beneficial effect. Green manure and fish manure also left no manurial residues.

Experiments at Dacca and Rajshahi with the planting of single seedlings of winter rice have not so far been successful. It is not improbable that to obtain success single planting must be carried out in conjunction with thinner sowing of seed beds. This will be tested by an experiment to be commenced next year.

The Entomological Collector has nearly completed the investigation of "paintaphih," a new insect which attacks rice in the Khasi Hills.

Sugarcane.

32. With the gradual improvement of cultivation, sugarcane at Jorhat station has begun to yield very satisfactory crops. One variety, Striped Mauritius, gave in 1910-11 an outturn equivalent to 3·4 tons of sugar per annum, and this without heavy manuring. On the results of the variety experiments at Jorhat the Deputy Director (Mr. Birt) remarks:—

> This year's results of both plant and ratoon cane clearly demonstrate the superiority of Striped Mauritius in yield of sugar per acre. This variety combines a comparatively high yield of cane per acre with a good quality juice, high in cane sugar and low in glucose content. It is easily propagated and is an exceedingly good ratooner. Two of the Barbadoes varieties, *viz.*, B. 147 and B 376, are also exceedingly promising. Although not such high yielders as Striped Mauritius, they give juice of very high quality.

Of the other varieties, Kheri and Magh have given fairly high yields, but their juices are of very poor quality. Kheri is a hard thin cane which will give a fair crop under adverse conditions and does not require such careful cultivation as the superior varieties. Magh is the variety largely grown by cultivators in the locality. It gives a fairly good plant crop, but we find that it is very susceptible to disease and is a very miserable ratooner.

On the strength of the results of the last three years' experiments, we are now able to definitely recommend Striped Mauritius as a variety superior in every respect to Magh in this locality. The two Barbadoes varieties, B. 147 and B. 376, are gradually getting acclimatised and establishing their reputations, and after further testing on a larger scale it is probable that we shall be in a position to recommend them also for general cultivation. From the point of view of the production of refined sugar, Striped Mauritius and the Barbadoes varieties are far superior to any of the others, while Kheri and Teli are the worst.

A variety experiment was commenced at Dacca with sets brought from Jorhat Agricultural Station. Striped Mauritus and some Barbadoes canes made excellent growth and will probably prove superior to the local variety, "Ganderi," good though that undoubtedly is. The experiment is being repeated this year on a larger scale.

Jute.

33. Investigations in jute cultivation have led to the conclusion that quality of fibre, as judged by the criteria of cellulose content and length of ultimate filaments, is controlled by environment as well as by heredity. This conclusion opens a new line of enquiry and may materially affect the course of future work. Cross fertilisation experiments have been continued and the results of the third generation of hybrids have removed all possibility of doubt that, in respect of colour, the jute plant follows Mendelian laws and that normally the plant is self-fertilised. The latter fact greatly simplifies the introduction into any locality of a new race of jute which, under the local conditions, will give a bigger outturn than the local races or an equal outturn of superior fibre. Unfortunately the trade offers no encouragement to the production of jute of good quality; a raiyat who offers for sale jute of really superior quality obtains only 4 to 8 annas a maund more than the price of inferior fibre. So long as this continues to be the case, it will pay the raiyat better to attend only to the production of the maximum quantity and leave quality alone. Further information regarding jute investigations will be found in Appendix I.

Tobacco.

34. Tobacco work at Burirhat has followed two lines, *viz.*, the production of—

(i) a high-grade cigar wrapper leaf;
(ii) tobacco suitable for good class cigarettes.

For the first purpose the Sumatra variety was grown and where the soil was in fairly good condition, excellent results were obtained. From one block of 1·10 acres 1,404 lbs. of leaf were sold for Rs. 1,558-8 and the cost of cultivation and curing was only Rs. 246-9-9 (exclusive of rent and value of cowdung, which would probably be covered by the price of the lowest grade of leaves not yet sold). These returns are not only highly satisfactory in themselves, but the prices are also far in excess of any hitherto obtained for tobacco grown in Rangpur district and probably higher than any ever realised for Indian grown tobacco.

For the second purpose Little Flemingan, White Burley, Connecticut seed leaf, and some Turkish tobaccos were fire-cured. Seven maunds of Little Flemingan were sold for Rs. 35 per maund, the total cost of production being about Rs. 23. Some other varieties realised even better prices, White Burley selling for Rs. 37-8 and a small lot of Turkish tobacco for Rs. 81-4 per maund.

It cannot be doubted that the prices realised indicate that there has been a marked improvement in the quality of the tobacco produced at Burirhat. Though the variations in the import duty make it difficult to gauge the extent of the improvement yet the fact remains that tobacco is now being produced of a type which meets the requirements of Indian manufacturers of cigars and cigarettes. There is ground for hope that such further improvements in quality may soon be effected that Burirhat tobacco may be acknowledged as the equal of good grades on the English market.

Potatoes.

35. Potato experiments were continued at Upper Shillong. In a variety experiment which has extended over 4 years, "King of Potatoes" has proved to be the heaviest yielder and the variety most immune to disease. Local seed of the Nainital variety stands second in outturn, but has more disease. Farm-grown stock of the "Magnum Bonum" variety still appears to be remarkably free from disease, but from new seed imported from England about half of the tubers obtained were diseased. An experiment contrasting the use of cut sets as against whole sets showed that in the case of winter seed it pays better to use cut sets, but with summer seed whole sets are more profitable. A planting experiment contrasting the Khasi method with that ordinarily followed in Europe has so far resulted in favour of the local method.

In a variety experiment at Burirhat, Darjeeling potatoes gave an outturn of about 120 maunds per acre as against 85 from the local variety, "Silbilati." Though the difference is great, it is not sufficient to justify us in recommending a general substitution of Darjeeling for the local variety which, besides being altogether free from disease, has remarkable keeping qualities.

Fruit trees.

36. But little progress was made with the experiments at the Fruit Station Some good samples of peaches of the "Early Rivers" and "Dr. Hogg" varieties were picked. Most of the other trees lost their fruit soon after it had set owing to the heavy rain and wind. The experiments are being continued by planting new trees in sheltered spots and providing shelter belts for the existing trees. To reduce vegetative growth and induce formation of more fruit on well matured spurs, manuring is being reduced and a system of steady pinching of shoots during the summer is being followed. A commencement in fruit tree experiments for the plains has been made on the Dacca Station, where the Economic Botanist has planted several varieties of mango, lichi, guava, pomelo, lime, citron, orange, custard-apple, bullock's heart, and pineapple.

In connection with the investigation of the orange tree disease in the Khasi Hills, attempts have been made for some years past to bud oranges on stocks of other varieties of citrus. Out of a large number of buds only 22 have been successful hitherto. With the abandonment of Wahjain the stocks grown for this purpose have been transferred to Dacca, where the budding experiments will be continued under the Economic Botanist. It should be mentioned that the citrus varieties planted in 1907 in land known to be infected with the orange disease are still thriving and show no sign of disease. According, however, to general reports it appears that the orange disease is now abating. The Imperial Mycologist has not yet been able to identify the fungus or work out its life history.

Green manure crops.

37. *Dhaincha* was grown at Dacca on 35 acres in 1910 and a still larger area in 1911. On highland the crop made good growth and particularly at the end of June last the waving fields of tall *dhaincha* presented a splendid appearance. Sunn hemp also grows well at Dacca but is not such an effective green manure and the nodules on its roots are not so numerous or so well distributed as on *dhaincha*. At Burirhat *dhiancha* sown in 1910 on poor soil made very little growth, but in 1911 on stiffer soil it was a great success. Where the soil is sandy cowpeas are a more suitable crop. They grow well at Burirhat and also at Dacca and Jorhat, but *dhaincha* is to be preferred because it can be ploughed in more easily.

Fodder crops.

38. *Euchlæna Mexicana*, an Australian fodder crop, was tried at Burirhat, Dacca, Jorhat, and Upper Shillong. At Burirhat it gave an outturn equivalent to about 345 maunds per acre, which was about 120 maunds less than was yielded by a neighbouring field of *jowar* to which the *Euchlæna* is very similar in appearance and habit of growth. At Dacca and Jorhat also the crop grew well, but not so well as *jowar*. At Shillong the climate proved unsuitable and only a very poor outturn was obtained.

The most successful of the fodder crops under trial at Upper Shillong is a local grass called *langtylli*. Even from this, however, the outturn in 1910 was equivalent only to 74 maunds per acre, which is much less than is obtained from maize or any of the local millets. After repeated failures the attempt to grow oats has been abandoned. Some crop which will provide green fodder during the winter and spring is a great desideratum in the Khasi Hills. Experiments in the cultivation of oats as a green fodder have met with scanty success at Burirhat, Dacca, and Jorhat. Probably the soil is not yet in a suitable condition to support this crop. At Rangpur, however, a good outturn was obtained. At Burirhat an attempt was made to grow peas mixed with oats, but the peas died out soon after germination. Guinea grass has now been introduced at Burirhat and is growing so well that with a little irrigation it may yield green fodder during the dry season.

CHAPTER IV.

DISSEMINATION.

Section I—Demonstrations.

Rice.

39. The most important demonstrations done during the year were those with bonemeal applied to rice land. In March—April last 12 demonstrations were commenced in villages near Dacca Farm. Bonemeal was applied at the rate of 3 maunds per acre on land bearing aus rice followed by winter rice in the same year. In 10 cases out of 12 the increased

profit on the aus rice alone more than repaid the cost of the manure. Bonemeal however, is somewhat slow in coming into effect and still better results are expected from the next 5 crops, without any further application of manure. Similar demonstrations are being carried out in the Khasi Hills; on new plots taken up in 1910 an average yield of 12·22 maunds of paddy and 10·89 maunds of straw per acre was obtained as compared with 8·55 maunds of paddy and 7·49 maunds of straw on the check plots. The results were less satisfactory than in the preceding year and four of the manured plots actually showed a loss. This may have been due to the heavy rain this year washing out the bonemeal, which was in the form of a fine powder and possibly insufficiently incorporated with the soil. Usually bonemeal gives better results in the second year than in the first. The demonstration plots manured only in 1909 gave in 1910 an average outturn of 16·73 maunds of paddy as against 9·8 maunds per acre on the check plots. Even at the high price of Rs. 4-6 per maund for bonemeal, the cost of manuring is more than covered in a single crop. Some plots manured in 1908 also showed in 1910 better yields than the control plots. In the current year demonstrations have been commenced in 9 new localities. The demonstrations are beginning to take effect, for this year 43 maunds of bonemeal were sold from the farm and some cultivators are roughly grinding bones to apply to their fields. In a demonstration on the Rangpur Association's farm the increase obtained by application of one maund of bonemeal, costing about Rs. 3, averaged $1\frac{3}{8}$ maunds of grain and $2\frac{3}{4}$ maunds of straw valued at Rs. 3-7. Here again the initial cost of manure has been covered in a single crop and the extra outturn expected in the ensuing two years or longer will be clear profit.

The value of *dhaincha* as a green manure for winter paddy was demonstrated on the Gauripur private farm. In one crop the manured plot gave an increased return valued at over Rs. 5 per acre after paying cost of manuring.

Demonstrations intended to introduce new varieties of paddy were not generally successful so far as outturn was concerned, but at Rangpur the fine Badshabhog variety gave a satisfactory yield of $22\frac{1}{2}$ maunds per acre, which was slightly better than the ordinary coarse local varieties. The highly prized Kataribhog variety also did nearly as well. C. P. fine aus, however, gave a smaller yield than the local varieties. Demonstrations with new varieties of rice in the Khasi and Lushai Hills and with boro paddy in Lakhimpur all failed. This result was probably due to lack of knowledge and care.

Good progress was made in wet rice cultivation in the Naga and Lushai Hills. The Subdivisional Officer of Mokokchang is showing the people how to make better use of the drainage water by adopting longer leads and choosing proper gradients. In the Lushai Hills good crops were obtained in the Champhai and North Vanlaiphai valleys; other small valleys suitable for wet rice cultivation are now being taken up; this year no less than 500 families are practising wet cultivation and the few limited areas suitable for this purpose will soon be taken up. In the Khasi Hills a demonstration to show the advantages of transplanting over boardcasting was not satisfactory; owing to the early winter the transplanted crop did not mature.

Sugarcane.

40. A set of Hadi's apparatus and centrifugal were lent to an Associate at Gauhati together with the services of a trained apprentice. Sugarcane from about two acres was converted into 78 maunds of gur of excellent quality and sold at Rs. 6-4 per maund. A small quantity of rab was also centrifugalled and produced good sugar, but the working of the centrifugal proved unduly expensive. The centrifugal was subsequently lent to the Superintendent of Tezpur Asylum who also carried out a small demonstration in sugar-making.

Demonstrations of the Striped Mauritius and B 147 varieties were carried out on a sugarcane farm in Golaghat subdivision. The proprietor also attempted to grow cane with oilcake as the only manure, but was not successful. The Agricultural Chemist has recommended that where cowdung is difficult to obtain the crop rotation of a sugarcane farm should be somewhat as follows:—

"After harvesting cane break up the land thoroughly with a deep plough and keep it cultivated, apply 10 maunds of lime per acre as soon as possible and take a crop of aus paddy, plough up deep and fallow in cold weather. Next year again apply 10 maunds lime per acre in the spring and take a crop of *dhaincha* as green manure, fallow all the cold weather. Third year sugarcane again; 50 maunds of oilcake in three or four doses. Fourth year sugarcane ratoon; 20 maunds of oilcake in two doses. Fifth year, if ratooned again, a further 20 maunds of oilcake per acre."

Demonstrations with Striped Mauritius are also being made at Gauhati. On the Rangpur Farm demonstration showed the superiority of Dacca Ganderi and Striped and White Tana over the best local variety.

Tobacco.

41. In demonstrations at Burirhat cowpeas ploughed in as green manure have been very successful as a preparation for tobacco and other rabi crops. This is now being recognised by the raiyats in the vicinity and there is some demand for cowpea seed for green manuring tobacco fields.

A small demonstration of the cultivation of the varieties of tobacco which have proved so successful at Burirhat was made by two of the Directors of the Rangpur Tobacco Company in the compound of their factory. The Department will probably commence an organised series of demonstrations in 1912-13, by which time it is hoped that a large stock of seed will be obtained of the varieties most suited for cigars and cigarettes and that it will be possible to make definite recommendations as to the best method of fire-curing.

Potatoes.

42. Demonstrations of the advantage of spraying potatoes with Bordeaux mixture were made in three villages near Shillong. The spraying was done twice, but owing to continuous rain the effect was less than was expected. In all cases the sprayed plots gave an increased outturn over the contrasted unsprayed plots. In one case the gain was at the rate of 12 maunds per acre, in the others it was only 6 and 4 maunds, respectively. In the first case there was a fair profit over the cost of spraying, but in the other two cases there would be a small loss. As the result of previous demonstrations some Khasi cultivators purchased from the farm 19 seers of copper sulphate which they used in spraying their own crops. The results they obtained will be ascertained.

On the farm of the Rangpur Association a demonstration was carried out to show how much heavier outturns and larger tubers are obtained from hill potatoes than from Silbilati, the local variety. Darjeeling "seed" yielded at the rate of 120·7 maunds per acre, Khasi-Nainital 75·1, Silbilati 48·4. The disadvantage of the hill variety is that new seed has to be imported every year, while Silbilati is practically free from disease and can be easily kept from one year to another. Some members of the Bogra Association also made simple demonstrations with hill potatoes; though the results obtained could not be described as good, the use of hill grown seed seems to be extending slightly among the cultivators of this district. A demonstration carred out on the Jorhat Farm gave yields at the rate of 113 maunds per acre from Khasi-Nainital seed and 94 maunds from Darjeeling. Some of the seed was certainly diseased and the crop also suffered from attacks of cutworms and red ants. In future Khasi seed will not be used for demonstrations. In the Lushai Hills Colonel Cole has been demonstrating the advantage of importing seed potatoes direct from England. In 1908 he imported 7 lbs. each of several English varieties; by the summer crop of 1910 these had so increased that he obtained 40 maunds from each of the varieties "Up-to-date" and "Myatt's Ashleaf." This year he has imported 3 cwt. of other English varieties. The potato demonstrations in the Lushai Hills have been very effectual, the total crops gathered in 1910 on cultivators' holdings amounting to over 3,000 maunds. The chief difficulty is in preserving seed, as only about $\frac{1}{5}$th of the tubers saved from the summer crop remain good till the ensuing March. Attempts to grow a winter crop for seed purposes have hitherto failed, but will be renewed. In the Naga Hills some 10 maunds of seed potatoes were distributed. Some of the Angami Nagas have been very successful in potato cultivation. In the Chittagong Hill Tracts the Chakma Raja, who is a correspondent of this department, made a demonstration with Khasi-Nainital and Darjeeling varieties; the results were not very successful, but more than paid expenses. On the Gauripur private experimental farm the advantages of irrigating potatoes were demonstrated, the increased yield being valued at Rs. 111 per acre, obtained by two irrigations costing Rs. 45 per acre. At the instance of the Director of Public Instruction demonstrations were carried out last cold weather at many Normal Training and Primary schools with seed potatoes supplied by this Department; results generally were not satisfactory owing doubtless to lack of experience on the part of the teachers.

Similar causes doubtless influenced the comparatively poor results obtained by several associates and correspondents who undertook to make demonstrations. No one should undertake to make a demonstration even on the most petty scale unless he is prepared to give constant attention to it. As an instance of a good demonstration on a small scale it may be mentioned that the Guru Training school at Serai in Brahmanbaria obtained an outturn of 32 seers from $2\frac{1}{2}$ seers of seed.

The increased yields of potatoes obtained from fields which have been green manured were demonstrated at Burirhat and Rangpur. On the latter farm an outturn of 105 maunds per acre of Silbilati potatoes was obtained from a field manured with cowpeas and cowdung, as against 30·7 maunds from a similar field manured with cowdung only.

Ground-nuts.

43. Trials of ground-nuts were made on a small scale at Jorhat and Burirhat. At Jorhat a yield of 26 maunds per acre was obtained, although there had been much loss owing to the depredations of rats and to the difficulty of harvesting. At Burirhat the crop was practically destroyed by disease.

Fruit tree cultivation.

44. The demonstrators employed in the Khasi Hills grafted 373 fruit trees in cultivators' gardens; the trees included pears, apples, peaches, nectarines, plums and apricots; 268 of the grafts proved successful. While doing the work the demonstrators explained to the cultivators the advantage and methods of grafting. Demonstrations in fruit growing in the Khasi Hills are carried on at the Fruit Station and in the gardens of some honorary correspondents. In several of the other hill districts demonstrations in fruit culture are being made. For some time past Colonel Cole, Superintendent of the Lushai Hills, has been actively pushing the introduction of fruit trees; he is now being assisted by two young Lushais trained at Pusa. During the year 5,500 Khasi orange plants were distributed to various villages; of 50 selected mango grafts obtained from Dacca, 45 are living; some vines from Shillong are already bearing fruit and a few fig trees are promising. In the Naga Hills the establishment of a demonstration orchard at Tisama about 6 miles from Kohima, has been sanctioned and a Gurkha mali is being trained by the Arboricultural Expert to take charge of it; the demonstrations will be confined to trees which thrive in warm moist climates, and ordinary English fruit, such as apples or cherries, will be avoided. In Manipur a demonstration orchard has been established with trees supplied by the Arboricultural Expert.

In the plains several honorary correspondents are demonstrating fruit tree cultivation. Amongst other interesting fruit trees on the farm of Babu Mohendra Mohan Lahiri at Gauhati there are some Nagpur oranges which are expected to yield fruit at a season when Khasi oranges cannot ordinarily be obtained. Most of the demonstrations with fig trees have proved unsuccessful. Babu Akshay Kumar Ghosh of Sibsagar has succeeded in growing pears of fairly good quality. Pineapples, lichis and papayas of good size and quality have been grown at the Jorhat station.

Cotton.

45. For the last three years the Department has been regularly distributing Buri cotton seed from Bengal to Kacharis and Mikirs in the neighbourhood of Lumding for experimental cultivation in their jhums. They complain that this variety ripens much later than the local variety and has the further disadvantage of being less erect in habit. A sample of the Buri cotton grown by them has been sent to the Imperial Cotton Specialist who reports very favourably and states that the cotton has been valued by Messrs. Tata & Sons at Rs. 375, as against Rs. 360 for fine Broach, per candy of 784 lbs. The seed saved from their crop of last year failed to germinate this year and, though informed of the high value set on their cotton by the Bombay merchants, the Kacharis are not very keen on continuing the experiment. In the Lushai Hills a small quantity of Buri seed distributed in 1910 is reported to have given good results.

Fodder crops.

46. For the provision of fodder during the rainy season in this Province, there is no other crop equal to jowar. This has been demonstrated repeatedly on the Dacca, Rajshahi, Rangpur and Burirhat farms. At Rangpur and Burirhat the average outturn was over 440 maunds per acre. Some raiyats have now been persuaded to put down small areas of this crop for themselves and, to further popularise its use, some demonstrations have been undertaken by the Rangpur Agricultural Association on cultivators' holdings.

Section II—Aid to the public.

Aid in combating insect pests.

47. The Agricultural Department endeavours to respond to every request for aid in combating outbreak of insect pests on crops. During 1910-1911 the Entomological Collector was able to visit almost every locality from which such a request was received. The amount of success attained depends on the extent to which the measures suggested commend themselves to the raiyats and the amount of trouble they are ready to undertake themselves. Unfortunately in many cases much delay occurred before the assistance of the Department was invoked, and when the Collector arrived, he found that the outbreak had subsided, and as no more immediate damage was to be feared,

most of the cultivators would not trouble to do anything out of the ordinary to prevent a recurrence. In outbreaks of the *leda poka* (rice ear-cutting caterpillar) which occurred in Narayanganj, Karimganj and South Sylhet subdivisions, the Entomological Collector told the raiyats to plough their fields immediately after harvest in order to expose the pupæ hibernating in the soils to the birds. The best of the cultivators do this on their own account; but in spite of the advice of the Entomological Collector and of influential local gentlemen, their example was not generally followed. For outbreaks of the *chunga poka* (semi-aquatic rice caterpillar) the Entomological Collector told the raiyats of an affected area in Tezpur subdivision to destroy the insects by letting the water out of the fields and assisted some of them in doing so, but all were not willing to take the trouble, though many knew from experience that the measure would be effectual. An outbreak of *chotka poka* (jute semi-looper) and *bicha poka* (Behar hairy caterpillar) in Faridpur district was not reported till too late for any action within the limits of reasonable expense; but the Collector has found many raiyats who successfully keep down these pests by hand-picking in the early stages.

Aid in combating fungus diseases.

48. In an outbreak of the red rot disease of sugarcane in South Sylhet, the Mycological Collector visited the affected fields in November 1910, and assisted the cultivators in uprooting and burning the diseased canes and instructed them to select cuttings free from any reddish tinge. In two outbreaks of the root disease of jute (*rhizoctonia biolocia*) in Rangpur and Vikrampur (Dacca), respectively, the Collector advised the application of lime, which has been successful at the Dacca Farm. At Gauhati and in Vikrampur rosin-wash applied to citrus trees proved effective. In May last the Collector sprayed a potato field of a large cultivator at Upper Shilong with Bordeaux mixture, instructing the people present how to make and apply the mixture. When the value of mycological work is more widely recognised there will be more applications for the help of the Mycological Collector.

Seed supply.

49. For the supply of good seed, manures and new implements to officers and honorary correspondents of the Department and other persons unable to obtain them from the ordinary dealers, a central seed depôt is maintained at Dacca. Seed issued is either grown on one of the departmental farms or specially selected by the Superintendent of the depôt and is invariably tested before issue, the guaranteed germination being a minimum of 85 per cent. A summary of the seeds, plants and manures issued during 1910-1911 is given in Appendix VI. Over 205 maunds of hill-grown seed potatoes were distributed from the seed depôt in addition to 77 maunds sold from Upper Shillong Station to Khasi cultivators. Unfortunately in 1910 the Phytophthora disease was very virulent in the Khasi Hills; the experiment made for the first time that year of distributing Shillong-grown seed through the seed depôt consequently resulted in the issue of an unduly large proportion of diseased tubers; the experiment must therefore be counted as a failure and will not be repeated. The seed purchased by the Superintendent in Darjeeling district proved generally satisfactory. As an instance of what can be done by good cultivation, it may be mentioned that one person supplied with 2 maunds of Darjeeling seed potatoes obtained a crop of 60 maunds, at the rate of 253 maunds per acre, and this without any extra manure or irrigation.

Two hundred and fifty maunds of paddy seed were issued from the seed depôt; this consisted mostly of deep water paddy supplied to applicants in Bengal. In addition, above 9 maunds of seed of good varieties of paddy were supplied to cultivators from the Rangpur Association's Farm.

There is a fairly strong demand for seeds of green manure crops. The seed depôt issued 87½ maunds of *dhaincha* seed and 12½ maunds of sunn hemp seed. Burirhat station supplied 3½ maunds and Rangpur Farm 1½ maunds of cowpea seed.

Most of the 64 maunds of jute seed issued from the seed depôt was supplied to applicants in Bengal. The Rangpur Association sold 3 maunds of jute seed grown on its own farm to cultivators in that district.

Over 11,000 cuttings of sugarcane were supplied from the seed depôt in addition to large numbers from Jorhat, Rajshahi and Rangpur. The varieties supplied from Jorhat were principally Striped Mauritius and B 147.

In addition to the plants issued from the seed depôt, nearly 400 fruit tree grafts and seedlings were distributed from the Fruit Station, Shillong, and over 6,500 from the Wahjain Tropical Plantation, the largest number consisting of orange seedlings.

Section III.—Operations for the improvement of livestock.

Cattle-breeding.

50. The Agricultural Department maintains a breeding herd at Upper Shillong Station with the object of introducing improved strains into the Khasi Hills. During the year seven three-year-old bulls were issued and 18 cows and heifers were sold by auction at an average price

of Rs. 56. Six of the young bulls were sold at fair prices; the last one together with the old stud bull "Tayler" was issued to a village where the people have agreed to remove all bulls not approved by us and to maintain our bulls in reasonably good condition; subject to these terms no charge was made for the bull. Similar operations are now being extended to another village where large dairy herds are kept. In this way it is hoped to gradually bring about a great improvement in the local milch cattle by the infusion of Patna blood.

The Government has ordered a general survey of the plough and milch cattle and the buffaloes of this province to be carried out by a special officer in conjunction with District Officers. In an irregular and spasmodic way several of the District and Local Boards are already maintaining stud bulls, but there is a general feeling that the type of bulls best suited for mating with the local cows to obtain progeny of the kind required for this province has not been sufficiently ascertained. The enquiry which the Government contemplates will have special reference to economic conditions and it is hoped that it will lead to the adoption of definite and systematic measures for the production of the type of animal, which most conforms to local requirements.

Sheep-breeding.

51. The sheep of the Khasi Hills produce mutton of good flavour, but the body weight of the animals is very small, and their wool is worthless. To improve the stock in these respects an experiment is being made in crossing the local ewes with Dumba rams. A breeding flock is maintained at the Upper Shillong Station, which at the end of the year comprised three Dumba rams with 66 Khasi and cross-bred ewes. Seven cross-bred rams were sold during the year. The experiment shows much promise as the butcher weight of the cross-bred sheep has increased by about 50 per cent., the fleeces are of some value and there is no appreciable loss of hardiness as compared with the local stock.

Last spring when importing from Baluchistan two new Dumba rams for Upper Shillong opportunity was taken to bring one for the North Cachar Hills and two for correspondents of the Department in Sylhet district. Two of the rams have succumbed, one to injuries received in a fight, another in an epidemic of rinderpest, the third survives and there is no reason why the experiment should not be repeated.

Poultry breeding.

52. The central poultry-breeding station for the plains is under the charge of Mr. Meggitt on the Dacca Farm. The work is restricted to China Langshans and Chittagongs. During last cold weather the hens laid fairly well and a good proportion of the eggs proved fertile. Mr. Meggitt reports:—"The very young Langshan chicks were perhaps not quite so hardy as the cross-breds and Chittagongs, but did equally well after a few weeks. The earlier hatched birds, which had made good growth ere the rains set in, have suffered little since, but amongst the later hatched ones some sickness and mortality has inevitably occurred." Mr. Meggitt is convinced that hatching should be commenced as soon as possible after the end of the rains in order to get the young chicks well established before the next rains begin. The breeding pens at the end of the year contained 6 cocks, 28 hens and 180 young stock. Arrangements are being made for distributing young stock and sittings of eggs to correspondents in the mofussal who are willing to take up breeding operations for the general improvement of the poultry in their vicinity.

Excellent progress has been made with the poultry operations under the Superintendent of the Lushai Hills. During the year 5,081 eggs were sold at two annas each and 169 fowls for Rs. 386-7-6. From enquiries made by Colonel Cole he believes that there must be now 10,000 imported birds in the district and probably double that number of half-bred birds. He finds that the pure Chittagong breed is best suited to the district as being the hardiest and the best layer. The poultry farm at Aijal is in charge of a Lushai named Dohnuna. The success attained during the past year is due to his efforts under the careful training and supervision of Colonel and Mrs. Cole. For the further extension of this work it is proposed that selected villages in the Lushai Hills should be regularly inspected and indifferent birds weeded out. Acclimatised birds of imported stock should be made available for these villages at a cost not exceeding Rs. 3 each and an undertaking given to purchase any approved birds offered for sale at the same price. It is further proposed that large numbers of these birds should be sent down yearly from the Lushai Hills for distribution in selected villages of other districts. Since the close of the year a small experiment on these lines has been made by sending birds to some villages in the Khasi Hills.

Section IV—Sericulture.

Rajshahi Division.

53. Sericultural operations have been undertaken with the object of assisting cultivators to check the steady decline in the silk rearing industry. This we are endeavouring to do in three ways—by (1) the supply of good seed, (2) demonstrations and (3) education. The measures adopted for educating young rearers are described under Chapter II. The Superintendent of Sericulture and his two travelling overseers, in addition to their work at the nurseries, visit rearers' houses and show them the methods by which diseases may be prevented and better results obtained. Our chief work is the supply of good seed; for this a central sericultural station has been established at Mirganj, where during 1910-1911 there were three rearing houses at work, and there are two out-lying stations at Banesvar and Kharkhari. Seed cocoons are sold at market prices and the object kept in view is to show a profit on working expenses and ultimately to dispose of the nurseries as going concerns to skilled rearers who would carry them on for their own profit and to the benefit of the rearing community. The following statement of the result of the year's work will show that the object of producing a profit has not quite been realised; but it is expected that, with a larger outturn and more experienced staff, the ensuing year will yield quite satisfactory results :—

Sericultural station.	Total outturn in kahan.	Average price realised per kahan seed cocoons.	Per cent. of disease, as ascertained at subsequent examination.	Average outturn subsequently obtained by casins per kahan seed.	Total cost of production.	Total sale-proceeds.	Remarks.
1	2	3	4	5	6	7	8
	Kahan.	Rs. a. p.		Md. srs.	Rs. a. p.	Rs. a. p.	
Mirganj	1,630	1 1 6	4	1 30	Cultivation and rearing ... 837 15 8	1,566 11 3	
					Pay of Head Rearer ... 359 8 2		
					„ Under Rearer ... 189 10 9		
					Rewards to Head Rearer ... 226 0 0		
					„ Under Rearer... 40 14 9		
					Petty repairs 37 9 0		
					Total ...1,691 10 4	1,566 11 3	
Baneswar	450	1 0 0	4	1 30	Cultivation and rearing ... 248 15 6	430 12 6	
					Pay of Head Rearer ... 100 0 0		
					„ Under Rearer ... 126 0 0		
					Rewards to Head Rearer ... 38 0 0		
					„ Under Rearer ... 35 8 0		
					Petty repairs 30 6 0		
					Total ... 578 7 6	430 12 6	
Kharkhari	291	1 3 0	4	1 30	Cultivation and rearing ... 146 2 9	354 4 0	
					Pay of Head Rearer ... 110 0 0		
					„ Under Rearer ... 66 0 0		
					Rewards to Head Rearer ... 57 0 0		
					„ Under Rearer ... 18 12 0		
					Petty repairs 13 13 3		
					Total ... 411 12 0	354 4 0	
Total—all stations ...	2,371	1 1 4	4	1 30	2,681 13 10	2,351 11 9	

The cost of production in the above statement includes wages of rearers and of all casual labour employed in cultivation, leaf-plucking, attending to worms and selling

seed; also all expenditure incurred for manures and repairs to houses and implements. Capital expenditure and administrative charges (*i.e.*, pay of Superintendent and travelling overseers, stationery and postage) are necessarily excluded.

Sixty-seven per cent. of the cocoons produced were sold for seed and the average price realised for all classes of cocoons was Re. 1-1-4 per lb. In these respects the results are fairly satisfactory, but the total outturn is not quite adequate as from five rearing houses a minimum of 4,000 kahans should be produced. It scarcely need be mentioned that our nurseries themselves are the best possible demonstration of the advantages of good sericultural practice, and the greater the profit realised from them, the more effective will be the demonstration. Rearers generally depute one of their own number to visit the nurseries for the purchase of seed and as many of them come from Malda and Murshidabad as well as Rajshahi district, the effect of hints picked up at the nurseries is widely spread. The true work of our sericultural stations is confined to making the best of the existing local breeds; but in his spare time the Superintendent is experimenting on a small scale with special breeds. A crop of French-Italian worms reared in February was quite successful, but it is doubtful whether this type of worm will ever become popular in the plains, for they can only be reared in the cold weather, a time when mulberry leaf is very difficult to obtain and the houses have to be artificially heated. A more hopeful experiment is the rearing of a special variety of the Chotopala (*Bombyx fortunatus*) making white cocoons which sells for better prices than the ordinary yellow cocoons. This variety will be brought to the notice of the rearers.

Mr. F. B. Fletcher, Officiating Imperial Entomologist, visited all the sericultural stations and principal rearing centres of Rajshahi Division in April last. His report and recommendations are still under the consideration of Government.

Khasi Hills.

54. For the 8th year in succession a demonstration in sericulture was made at the Fruit Experiment Station. From 1½ ounce of imported seed 4½ maunds of green cocoons were obtained, which, after drying in an oven, gave 1½ maunds of dry cocoons. The demonstration was carried out by a Khasi youth trained at Rajshahi Sericultural School. Owing to constant rain from the middle of April the weather was particularly unfavourable, but had the worms received more attention somewhat better results would have been obtained. Another Khasi boy trained at Rajshahi reared some silk worms at his own expense at Mahadev; unfortunately a storm destroyed the house, but a few worms saved gave cocoons of good quality. Several people in the Khasi Hills have planted mulberry, but only three with the definite object of taking up sericulture as a regular business. It must be admitted that the progress made in introducing sericulture into the Khasi Hills is very slow; but when sufficient mulberry trees have been established for private cultivators to commence rearing, we may hope that the industry will rapidly advance.

Section V—Agricultural Shows and Exhibitions.

Allahabad Exhibition.

55. This Department took a considerable part in the All-India Exhibition held at Allahabad in 1911 and the Local Government was pleased not only to depute all the senior officers of this Department, but also to contribute a part of the expenses of 11 private gentlemen selected for their active interest in agricultural development, to enable them to see the Exhibition and attend the Agricultural Conference held from 13th to 18th January 1911. The members of the party found that the exhibition was so large that the time of their stay was barely sufficient for a full examination of the various agricultural exhibits of interest to this province. A brief account of the exhibition by Mr. B. C. Basu is published in our Year Book for 1318B.S. The principal exhibits contributed by this Department comprised a large collection of Indian and foreign fibres prepared by the Fibre Expert, samples, arranged by the Economic Botanist, of the most important varieties of aus, aman, sail and boro rice grown in this province and some samples of tobacco grown and prepared at Burirhat, which attracted particular notice.

Comilla Exhibition.

56. In connection with the Chakla Roshnabad Punyaha Mela, an exhibition was held at Comilla from the 10th to the 24th July 1910. This Department sent representative exhibits of rice, pulses, oilseeds, fibres, fodder crops and green manure crops. Demonstrations were given of the working of the turn-wrest and other new ploughs and the Planet junior hoe. Special entomological and mycological exhibits were sent comprising specimens of insects and fungi injurious to paddy, jute, sugarcane and other crops; the life history of each pest and the most practical methods of coping with it were explained by officers in charge of the exhibits.

57. An exhibition was held at Malda in February 1911 and was well attended specially on the two last days when enormous crowds assembled. Much trouble had been taken by the committee in preparing buildings and in other preliminary arrangements. The Agricultural Department gave demonstrations of a turn-wrest plough and a Planet junior hoe. To make the effect more lasting these demonstrations were commenced on suitable fields in the district a month before the exhibition and continued for a month after its close. A special exhibit of good samples of silk and improved breeds of silkworms was under the charge of the Sericultural Superintendent. This attracted some notice; but as Malda is now the principal silk-producing district in the Province, the sericultural section should be made larger and better advertised at future exhibitions in Malda. The other important exhibits are described in a paper contributed by Mr. B. C. Basu to the Year Book of 1318B.S.

Malda Exhibition.

Section VI—Agricultural Associations and Associates.

58. Several of the members carried out experiments, chiefly with paddy and potatoes. The results were fair, but not so striking as they probably would have been but for the lack of practical experience. They seem to have resulted in a small extension of the cultivation of Darjeeling potatoes. A meeting was held on the 31st of May at which a programme of experiments to be made during the ensuing year was settled.

Bogra Agricultural Association.

59. The Rangpur Farm which since 1908 has been under the management of the Association, supported by large contributions from Government and the District Board, has not proved a great success, and the District Board contribution having terminated, the Association at a meeting on 22nd February 1911 resolved that the farm should be offered to Government to be conducted as a demonstration farm and that a deed of gift should be executed making over the land, buildings, cattle and other appurtenances. Government has accepted the offer and taken over the farm from 1st August 1911. It is proposed that the farm should be utilised as a base for the work of a district agricultural officer. The functions of the Association hereafter will be to advise the officers of the department and the Collector in matters agricultural and to assist in disseminating results of improvements introduced on the Government farms. The Secretary of the Association, Babu Ashutosh Lahiri, and Babu Rajani Kanta Bhattacharja have done much to further agricultural improvements through the Association, the farm and on their own lands; had the other members taken an equally active interest the Association would have been more of a success.

Rangpur Agricultural Association.

60. At the end of the year 9 of the honorary correspondents also held the post of Associate of the department; all of them carry out at least one demonstration every year of an improvement recommended by us. Their number could be increased without any difficulty and this will be done as soon as the sanctioned number of supervisors has been appointed. However expert an Associate may be in farming on established methods, it is natural that without supervision mistakes in detail occur when he goes to carry out new methods of which his knowledge is confined to published leaflets and an occasional visit to one of our agricultural stations. The appointment of district agricultural officers will help in developing and co-ordinating the efforts of Associates and keep in touch with the new developments of our experimental work.

Associates.

The Associates of the Khasi Hills together with Siems, village headmen, and other Khasis who take an intelligent interest in agriculture attended a meeting held at the Upper Shillong station in May 1911. They were shown all the work in progress on the station, and those on whose land demonstrations had been carried out, told the others the results obtained. On this occasion for the first time the meeting was attended by His Honour the Lieutenant-Governor, whose presence and keen interest were greatly appreciated.

CHAPTER V.

ARBORICULTURE.

61. As opportunities permit subordinates of District and Local Boards and Municipalities are being trained in arboriculture. For this purpose a class is held annually in August—September at the Sibpur Botanical Garden. In 1910, seven officers of this province joined the class. In 1911, six more have been permitted to attend. By the end of September 29 officers in all will have passed through a course of arboricultural training.

Training.

62. Instructions for the preparation of working plans and for the planting and maintenance of trees on road-sides and in other public places have been published and circulated to all local bodies. Working plans have been received from the District Boards of Dacca, Tippera, Noakhali, Chittagong and Mymensingh, and advice has been offered regarding a few modifications that seemed necessary to ensure the success of the operations.

Working plans.

63. The avenues in the new civil station at Dacca have been satisfactorily completed and in the future will add greatly to the appearance of the place. The levelling, dressing, laying out and planting of compounds of the new public buildings and official residences is being done by the Arboricultural Expert under the control of the Superintending Engineer, Dacca. For the supply of plants a large nursery is maintained where new stock is propagated by cuttings, grafts, gutis and seedlings. The nursery is not restricted to ornamental trees and shrubs, but fruit trees are also included and this work affords means for training a few young men in fruit tree culture.

Dacca New Station Improvement.

64. A nursery is maintained in Shillong also to supply ornamental trees and shrubs for public and private gardens. Many additions to the stock were made during the year and over 1,100 plants were issued. In May last the Arboricultural Expert visited Shillong and arranged the plants in the nursery according to a scheme prepared by Mr. Proudlock, which makes it easy to ascertain at any time what stock of each kind of plant the nursery contains.

Shillong Station Improvement.

65. Mr. R. L. Proudlock went on long leave on the 11th October 1910. Pending the appointment of a substitute, Mr. Hector, Economic Botanist, took charge of the Arboricultural Expert's duties at Dacca. On the 26th April, Mr. E. S. Dodd, Assistant Curator, Sibpur Botanical Gardens, was appointed to officiate as Arboricultural Expert until Mr. Proudlock's return. The delay that occurred in procuring a substitute for Mr. Proudlock was very detrimental to the work in Dacca, but Mr. Dodd has now succeeded in restoring everything to excellent order.

Arboricultural Expert.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

66. Crop forecasts, weekly and annual Season and Crop Reports, the Annual Report on Tea Cultivation and returns of Trade, Prices, Wages and all agricultural statistics are published periodically by the department.

Statistical Publications.

67. *Farm Reports*—A report on the work of each agricultural station is published annually in the autumn.

Agricultural Publications.

Year Book.—A summary of the departmental report with additional articles of special interest is published annually in Bengali and distributed to all Bengali-speaking village panchayats and primary school masters throughout the province. A limited edition is also published in English. Of the Bengali edition for the current year (1318B. S.) over 26,000 copies have been issued.

Leaflets.—The only new leaflets issued during the year were "Hints on the cultivation of the fig tree" and a circular letter to the cultivators in the Khasi Hills by Mr. Basu. A revised price list of the seed depôt and rules for the supply of seeds implements and manures at reduced rates to Associates and Correspondents were also published.

Other Publications.—A note by Mr. B. C. Basu on jute in rotation with paddy and its effect on food-crops was published in the "Agricultural Journal of India" for July 1910. The note summarises the results of an enquiry made throughout the province. The most important conclusion is that about two-thirds of the total area under jute bears a second crop in the same year.

In the issue of the same journal for September, Mr. Strong, Officiating Director published an account of the Dhubri Exhibition of 1910, which was the best ever held in Assam.

Mr. Meggitt, Agricultural Chemist, in collaboration with Dr. Mann of Poona has written a note on the Composition of the Milk of some breeds of Indian Cows and Buffaloes.

For the forthcoming meeting of the Board of Agriculture Mr. B. C. Basu has written a note on the supply and use of oil-cakes in this province. Mr. Meggitt has also written a note on manures available in Eastern Bengal and Assam and in collaboration with Mr. Birt, has contributed a paper on fertilisers, the most important object

of which is to demonstrate the unsuitability of soluble fertillisers for the use of the ordinary cultivator in this country. At the same time a scheme of manuring is devised for them which is recommended for its safety, simplicity, and tendency to promote permanent improvement rather than mere temporary stimulation of the soil.

A collection of coloured plates of insects of importance to agriculture in this province, with notes in Bengali, has been compiled, and a small edition will be issued shortly.

Honorary Correspondents.

68. To keep the Department in touch with the needs of the agricultural population, a certain number of persons have been selected to act as honorary correspondents. Through them information in regard to outbreaks of cattle-disease and failures of crops due to other causes are received earlier and in more complete form than through the usual official channel.

Reports from these correspondents also afford a useful check on official estimate contained in crop forecasts. Correspondents also constitute a very useful medium for extending to the cultivators a knowledge of the work being done and the improvements recommended by the Department. Some of the correspondents are also associates; most of those who are not also generally carry out some experiments or demonstrations, in which they are assisted and supervised as far as possible by officers of the Department. At the end of the year there were 48 accredited correspondents distributed over 18 districts. A list of their names and addresses is given in Appendix V.

CHAPTER VII.

MISCELLANEOUS.

Handloom weaving.

69. Mr. Narayan Pillay has been working as a peripatetic weaving instructor since January 1910. Whenever applications are received from a body of handloom weavers that they desire to receive advice and instruction in improving their looms or their methods of weaving and warping, the instructor is sent to them and remains with them until such improved methods as they are willing to adopt are thoroughly understood and actually in working. For three or four months, up to the middle of August 1910, Mr. Pillay's services were lent to the Manipur State, where he introduced the Salvation Army loom and demonstrated other improvements in weaving to the local weavers. Two Manipur women trained by him have now been appointed as instructresses in a weaving school. The Instructor then proceeded to Pabna district, gave advice and assistance for the improvement of a handloom weaving factory in the headquarters station, visited various other weaving centres and revisited Bharenga. On this occasion he introduced the weaving of dhurries, twills, checks, and other materials which the local weavers had not previously made, but which they readily took up on finding that there is a strong local demand for such goods. Various improvements to weaving accessories were also introduced. Mr. Pillay then visited the exhibitions at Allahabad and Malda. The handloom exhibits at the former were somewhat disappointing. At Malda the demonstration of the Salvation Army loom attracted much attention and the master and two senior students of the local weaving school were trained by Mr. Pillay in its working. The next requisition for Mr. Pillay's services came from Barkanta near Comilla. Mr. Pillay constructed and took there a new warping mill and some loom accessories; these improvements together with the fly-shuttle loom and the Salvation Army loom were demonstrated to many weavers, from amongst whom four were selected and given a thorough training in all the new processes. The weavers are readily adopting the improvements and have ordered a Salvation Army loom made specially wide to suit their own ideas. At the close of the year the Instructor paid a visit to Gopalganj in Faridpur where he inspected the weaving school and advised on its development.

Mr. Pillay's method of working by demonstrations carried on for several weeks in succession in the same village is having much greater results than all the measures previously adopted for the benefit of the handloom industry. He has proved himself a thoroughly practical man, able to appreciate and meet the difficulties and requirements of weavers in different places. On my recommendation Government has sanctioned the permanent retention of Mr. Pillay in the post of weaving instructor.

Serampur Weaving Institute.

70. This Province shares with Bengal the expense of maintaining a Weaving Institute at Serampur, but hitherto it has been of very little advantage to us. During 1910-1911 ten scholarships of Rs. 15 per mensem were offered by Government, tenable for a two-year course in the upper class, but only one candidate with the necessary qualifications applied; including this man there are now two students of Eastern Bengal and Assam under training at the institute.

APPENDIX I.

Report on the work done by the Fibre Expert.

Classification of the races of jute.

In collaboration with the Reporter on Economic Products, a final account of the work of classification of the races of jute in Bengal and Assam has been prepared and will shortly be published.

Experiments in the selection of jute for the production of superior fibre.

Preliminary trials have shown that, using cellulose content and the length of ultimate filaments in the fibre as criteria, distinct differences can be detected in the quality of the fibre produced by different plants of jute. On this basis a number of plants were selected, the seed of which was sown separately. Examination of the fibre of the plants produced from this seed now indicates that the conditions under which the plant is grown may influence the quality of the fibre to a considerable extent; but a few races seemed less liable to variation than others and it has therefore become necessary to investigate this point under strictly controlled conditions. As the soil of the Dacca Farm is at present much too uneven for such work a small pot culture house has been erected and a commencement has been made with the enquiry, the first results of which will be available at the end of the present season. Plot experiments with the same object in view are also being carried out at Pusa. At Dacca, besides duplication of the Pusa plot on a larger scale, seed of selected plants has been sown side by side with unselected seed of the same race and the respective fibres of the former and of the latter will be compared, in order to arrive at more definite conclusions as to how far superiority of fibre is a hereditary function.

From the above remarks it will be gathered that there are apparently two possible factors controlling the quality of jute and, probably, of other fibres, *viz.*, a hereditary one, intrinsic in the plant; and a second one, due to environment, a term expressing the aggregate effect of the conditions under which the plant may be grown. The latter factor would of course have a different value in different districts and it may, or may not, affect all races to the same extent. For example some races may be less sensitive to change than others. There has, as already remarked, been some slight indication of this in the results of the last year; but it is impossible to make any definite statement one way or the other until further data are available.

Cross fertilization experiments with jute.

The results obtained from the cultivation of the third generation of hybrids have generally confirmed the conclusions given in last years's report. In collaboration with the Reporter on Economic Products a full account of these experiments has been prepared and is being published in the Memoirs of the Indian Department of Agriculture. Further work has been commenced with the object of assisting, if possible, the investigation already mentioned into the question of superior fibre.

Cultivation of jute on low lying rice lands.

Owing to the present lack of a sufficiently numerous trained supervising staff it has been decided for the present to discontinue the experiments on low lands in the Chittagong district, and the above trials have been substituted. The conditions at Dacca are somewhat similar to those obtaining at Chittagong, in that the soil is generally in a sufficiently moist state, immediately after the reaping of the rice crop, to allow of its being prepared at once for the sowing of jute. The first sowings in January were unsuccessful, owing to too rapid loss of moisture from the soil. Later sowings on the first rains in March produced an excellent crop of 20½ maunds per acre in one plot; but in another case the germination was uneven and the resulting crop will probably not yield more than 10—12 maunds per acre. So far as they go, the indication are that, owing to the absolute necessity for early sowing and the consequent precarious moisture conditions, the growing of jute in such low lands involves an element of uncertainty, on the other hand a really good crop is quite reasonably probable, and it would appear that, with ordinary care, a sufficient yield of fibre might in any case be realized to pay for expenses incurred at least. It should be noted that the growing of jute on these lands need not interfere in any way with the usual crop of rice. The jute can always be taken off early enough to allow of the preparation of the land in good time for rice.

Distribution of seed.

During the present season 64 maunds (5,000 lbs.) of jute seed have been sold. Of this amount 30 maunds were supplied, in bulk, for distribution through the Bengal Department of Agriculture. An interesting feature is that 2½ maunds were sold direct to cultivators in the neighbourhood of the Dacca Farm. This demand from the Dacca cultivators was probably partly due to the fact that, owing to rain at the time of collecting it, their own supply failed to some extent; but it is encouraging to know that they preferred to come to the Farm rather than purchase seed in neighbouring bazars. About 10 acres at the Rajshahi Farm have been put under jute, for seed, in the current season.

FLAX.

Experiments at Pusa.

In the season 1909-1910 the difference in yield, at Dooriah, from land manured with "Seeth" (indigo refuse) and land not directly manured for flax, was equivalent to about Rs. 60 per acre. With the object of obtaining information regarding the manurial requirements of flax, a series of plots was laid down at Pusa in the season 1910-1911. The scheme, which was approved by the Inspector General of Agriculture, included the use of farm yard manure and of green-manure, both alone and with the addition of mineral manures. The remainder of the plots were treated with mineral manures alone.

The original intention was to have the straw from the various plots worked up at Dooriah; but the appearance of Dodder in another field of linseed at Pusa, made it inadvisable to risk spreading the disease by doing so. We therefore contented ourselves by weighing the total produce of each plot before destroying it. During the rains the land was flooded and, although the yield of the plots which only received mineral manures does not seem to have been affected, it is possible that the unexpectedly poor results obtained from the green-manured plots and also, to a less degree, from those treated with farm yard manure may be partly due to this cause.

It would be useless in any case to draw definite conclusions from a single year's experiments; but the results give some indications which are worth noting in the framing of future trials. A complete mineral manure, containing Nitrogen, Phosphoric acid and Potash gave the highest yield, the increase due to the fertilizer (average of six plots) amounting to about 1,100 lbs. of total produce per acre, as compared with the "no manure" plots (average of two). Nitrogen appears to be the controlling factor as regards yield of straw; but no results are yet available to show how the percentage of fibre in the plant or its quality is affected, a very important point.

The yields of the plots which received farm Yard manure were hardly better than the average of the "no manure" plots and the addition of Phosphates and Potash did not produce any marked improvement. No artificial Nitrogen was added to these plots as the farm Yard manure contained the same amount of Nitrogen (30 lbs. per acre) as was applied in the complete mineral fertilizer. The yield from each of the three green-manure plots was considerably lower than those obtained from the "no manure" plots.

The failure of the farm yard manure plots and of the green-manure plots appears to be associated in each case with the application of a considerable amount of organic matter. Whether this is the only cause or whether the flooding of the land also produced an adverse effect can only be decided by further work.

Results at Dooriah.

In the season 1909-1910 fifty acres of flax were grown at Dooriah. The straw was worked up in the season 1910-1911 and produced 188 maunds, an average of over 3¾ maunds per acre, of flax, with 124 maunds of tow, and 184 maunds of seed. In the report on the work, which is being published as a bulletin of the Indian Agricultural Department, with an introduction by the Inspector General of Agriculture, the estimated net profit is given at Rs. 60 per acre, after deducting all charges, including depreciation and freightage to Europe. In making this estimate the price of flax was assumed to be £ 60 per ton and that of tow £ 18 per ton. Since the report was written the whole of the tow has been sold in Belgium at £ 29 per ton and a portion of the flax has been disposed of at £ 68 per ton. During the season 1910-11 about 77 acres were under flax at Dooriah and the average yield of straw works out at 47 maunds per acre, as against 40 maunds per acre in the previous year.

Flax in Assam.

During the last season Mr. H. J. Lawrie grew half an acre of flax at Baihata, Assam. The site of the plot was rather uneven, containing sand pockets, on which very little flax grew; but the yield of straw was at the rate of 35 maunds per acre. The crop was inspected by the Belgian flax expert employed at Dooriah, in company with the writer, and it was decided that the nature of the crop and the quality of the straw justified a trial on a larger scale. Provisional arrangements were consequently made by Mr. Lawrie to grow about 5 acres but it is not yet quite certain that this plan can be put into execution in the coming season.

While there now seems a very reasonable prospect of the establishment of a successful flax industry in Behar, the higher cost of labour in Assam will make success more difficult. Other conditions, however, are probably more favourable for flax in Assam than in Behar and there seems no reason why, by judicious treatment, the yield should not be increased sufficiently to compensate for the enhanced cost of labour. The average outturn of fibre in Belgium is 5¾ maunds per acre and the recently published report of the commission on the Irish flax growing industry gives similar figures for Ireland. As already stated, the average yield at Dooriah in 1909-10 was only 3½ maunds per acre; so that there is ample margin for improvement.

Importation of flax seed from Europe.

In continuation of the experiments in connection with the importation of flax seed from Europe two consignments of seed, each thoroughly dried before despatch, but in the packing of which no special precautions were taken, arrived in India last year (1910), at the end of September and in January 1911, respectively. It was to be expected, in the light of former experience, that the 2nd consignment would be good; but as the first one arrived while the weather was still hot, there was some doubt as to what its condition would be. As a matter of fact, both consignments were good.

The indications now are that, provided the seed is a well matured and even sample and that it is quite thoroughly dried before it leaves Europe, no special precautions need be taken in the packing, excepting to protect it from becoming wet on the journey. For this purpose it may be packed loose in barrels. The drying is so necessary because in the cooler climate of Europe the seed naturally contains more moisture. Without special drying, therefore, it "sweats" when brought into a hot atmosphere. In importing seed I consider it would be advisable to arrange for it to arrive in India either before the commencement of the rains, say before the end of April, or not earlier than the last week in September. In the former case it could easily be thoroughly redried before storing; while, in the latter case, when redrying might be difficult, no storing would be needed before sowing. The cost of seed imported in this way amounts to about Rs. 19 per maund, including freightage from Calcutta; when packed in sealed tin lined boxes it costs nearer Rs. 30 per maund.

Flax in the United Provinces.

Arrangements have been made by the United Provinces Agricultural Department to take up the experimental cultivation of flax in the coming season. Preliminary trials have already indicated the possibility of good crops on irrigated lands.

Possibility of the production of flax seed in the Hill tracts of India.

Small plots of flax were grown last year at Shillong and at the Ootacamund Botanical Gardens. At Shillong the experiment was not a great success, but the outturn of the plot of $\frac{1}{50}$th acre at Ootacamund amounted to 2½ maunds of seed and 31 maunds of straw per acre. The trials are being reapeated this year, the object being to see how far the heavy expense involved in importing seed from Europe could be obviated.

During the year under review, I spent 95 days on tour and I visited the following places amongst

Tours.

others :—

Chittagong, Baihata, Haflong, Serajganj and Jalpaiguri, etc., the object of my visits being enquiries in connection with jute or flax.

I also spent some days at the Allahabad Exhibition where I was a member of the committee appointed to examine and award prizes to the fibre extracting machines entered for competition.

Dacca ;
The 30th August 1911.

ROBERT S. FINLOW.

APPENDIX II.

Report of the Agricultural Chemist.

1. I have been on tour or absent from headquarters during 101 days, visiting Jorhat four times in connection with the Cane and other Experimental work being carried on there, and also attending the Allahabad Exhibition in January.

Tours.

While at Jorhat, in company with the Deputy Director of Agriculture, I also inspected the Sugar-cane farm of Sreejut Debesvar Gosain at Barpathar to advise as to the question of the treatment of partially exhausted land which is rapidly accumulating under the Gosain's treatment.

2. This work in connection chiefly with soil problems on the Dacca, Jorhat, and Burirhat Farms has occupied a good deal of my attention, and seems likely to be a fruitful line of work. Climatic and other conditions have led in some cases to our soils becoming very deficient in some elements of plant food, and very abnormal in other directions. For instance most of them are very deficient in carbonate of lime, and many acid in character, which, for reasons stated in my interim report on the Dacca Farm soil, gives rise to extraordinary conditions, and militates seriously against obtaining good normal crops, especially in the rabi season.

Soil work.

In conjunction with the Deputy Director of Agriculture, practical field work, in the form of more or less permanent experiments, has been undertaken on all the above Farms, based on a three years' practical acquaintance with these soils and upon the results of examinations made in my Laboratory. Though this work is yet too young to have given anything but very promising indications at Dacca, at Jorhat last cold weather our treatment enabled us to grow Rabi crops such as Oats, Gram, etc., which up to then we had been unable to do. At Burirhat also indications are not wanting that our work is likely to yield good results, though for reasons stated in my report on the Burirhat soils, it will take some time to settle the point finally. At this farm we have had perforce to modify considerably the method we are trying at Dacca and Jorhat, because the soil at Burirhat is of such a very different physical character. On account of our peculiar conditions, soil work in this province assumes greater importance than in some parts of India and I have been and am giving it close attention.

In our manurial treatment we are endeavouring as far as possible to exploit the natural resources of the country, as opposed to pushing the use of soluble forcing artificials, which in our case at any rate I consider would be extremely bad policy. We consider we shall thus meet with more success and with less difficulty in overcoming opposition as to the extended use of manures in general.

We are developing our manurial experimental work on what we term "permanent improvement lines; that is to say while paying great attention to improving the soil's general constitution and climate, we are endeavouring to work out a scheme whereby we shall add to the soil rather more of each plant food element that will be removed by crops and by other channels, so that we hope to be in a position to show the cultivators how they may build up a thoroughly healthy soil, capable of growing good crops in general at a minimum of expense. In other words, we aim at showing them how to prepare a thoroughly healthy foundation. We are adopting this policy rather than the one which advocated the extended use of soluble forcing artificials, which on account of expense, liability to abuse in unskilled hands and the peculiar conditions of many of the soils of this province, we believe to be more or less unsound policy for us at any rate, and which, though it might lead to temporary stimulation, would in many cases have a deleterious effect upon our soils and also would not have a lasting effect.

3. *Sugar work.*—This occupied almost my whole time and attention for some 8 months out of the year. I consider it unnecessary to go further into this aspect of my work here. A full account will be found in my tour diary submitted in May of this year.

4. *Green manuring work.*—In conjunction with Mr. Hector I undertook some preliminary work on the comparative value of some legume crops for green manuring purposes. In connection with our soil problems, we require green manure crops to meet varying conditions, *e.g.*, of soil, of period and season of growth, of power to resist waterlogging, etc., etc., we had perforce to limit our work to two varieties last year, Dhaincha and Sunn-hemp. These two crops do not meet all our requirements *e.g.*, although Dhaincha does extraordinarily well in some situations and soils, it fails more or less under others; it does badly on our low lands where early water is apt to collect. Both supply large amounts of organic matter and nitrogen where they do well, Dhaincha under our conditions easily taking the lead. I found that a good crop of Dhaincha will provide well over 100 lbs. of nitrogen and up to 4 tons of dry organic matter per acre, this amount of nitrogen being equal to a dressing of nearly 7 cwt. nitrate of soda per acre.

Green manuring is of enormous importance in this country, and we are extending this work considerably, but it is a matter of time to get together sufficient seed of same varieties for comparative experimental work.

Our object is to get green manure crops suited to various conditions, and to form an estimate by analysis as to the comparative amounts of nitrogen and organic matter they add to the soil. Among other matters in this connection which are claiming attention is the extent of root development, which is of importance in opening up the soil, and the facility of incorporation with the soil and subsequent rate of decay.

5. *Nutrition of the winter paddy crop.*—A series of samples of plants taken from the field from the seedling state, through the growing period up to the ripe stage, was taken by me last year.

This was with a view to studying its food requirements generally, and the period of growth during which the individual food factors are chiefly required by the plant.

This crop lives its life under such extraordinary conditions as regards water, that any manurial experiments to be made will have to be very carefully considered to ensure the most economical use of manures, and a knowledge of its chief requirements and of the periods during which the food elements are chiefly taken up, should be of great value. This was the reason for taking up this work, along with a desire to know more of the fundamental life of the paddy crop, concerning which so little has been done up to date. I have found it impossible so far to complete this work.

6. *Miscellaneous*—A good deal of my time has necessarily been taken up in perfecting methods of analysis suited to our conditions of work here. To mention one instance only, our gas supply does not admit of the use of a combustion furnace. I had therefore to work up another method for the determinnation of organic matter in soils, and organic carbon in substances in general. After some weeks of experiment, I have solved this problem satisfactorily, a problem which had to be solved in connection with analytical work on soils and other substances. Other instances I might give, and the aggregate amount of time involved in settling such points is necessarily large at first.

The 31st July 1911.

A. A. MEGGITT,
Agricultural Chemist, Eastern Bengal and Assam.

APPENDIX III.

REPORT OF THE ECONOMIC BOTANIST.

Staff.—The Economic Botanist remained in charge of the section throughout the year. Mr. S.G. Sharangpani, a graduate of Poona, joined the staff as laboratory assistant in August 1910. Babu Amrita Lal Som, Mycological Collector, continued to work under the supervision of the Economic Botanist.

Tours.—During the year the Economic Botanist was thirty-four days on tour and visited the Wahjain Tropical Plantation, the Burirhat Farm, the Chaitanya Nursery at Jamalpur, and also attended the Allahabad Exhibition to which a collection of the most important varieties of rice grown in the Province was sent.

Work.—The preliminary work of preparing the area of land for botanical purposes is now finished. Fourteen acres have been cleared, levelled and divided into four blocks. One of these blocks, four and a half acres in extent, has been reserved for growing fruit trees, while the others will in the meantime be utilised for ordinary plant breeding work. The area is typical of the high-land of the Dacca Farm and a lot of work remains to be done in bringing it into a fit condition for experimental work.

Roads have been constructed round the fruit area, a six-foot diameter well dug for irrigating the trees and a tool-shed erected.

The fruit area is intended for the experimental trial of such fruit trees as are likely to succeed in Dacca District.

The following varieties of fruit trees have already been secured and most of them planted out.

I, Mangoes—
- Khirsapatee.
- Lengra.
- Lamba Bhaduree.
- Fuzlee.
- Gopal Bhog.
- Jalibanda.

II. Lichees—
- Bedana.
- Mozzuferpore.
- McLean's.
- China.

III. Guavas—
- Allahabad.

IV. Pomelos—
- White-fleshed.
- Red-fleshed.

V. Limes—
- Kagzi.
- Soh-Myndong (Khasia-Hills).

VI. Citrons—
- Soh-kwit (Khasia Hills).
- Soh-Sying (Khasia Hills).

VII. Custard Apples.—
- Local.

VIII. Bullock's Heart—
- Local.

IX Pine-apples—
- Sylhet.
- Queen.
- Red Ceylon.
- Smooth Cayenne.
- Singapore.
- Kew.

Country Local.

The survey of the most important varieties of transplanted winter rice *aus* rice has been continued.

About one hundred and fifty varieties, from the chief rice-growing districts of the Province, were grown on the farm last year, and a large number selected for further trials.

Other crops under investigation are the varieties of Brassica (mustard, sarson and rape), sesamum, (*til*) and Capsicum (Chillees) grown in the province, and a variety of leguminous crops, the last mentioned chiefly with a view to their utility as green-manure crops.

An experiment in growing Garo Hill cotton in the Chittagong Hill Tracts has also been started in order to see whether the Garo Hill cotton retains its superiority to the local cotton when grown in the same locality. Seed of Garo Hill cotton has been sent to Raja Bhuban Mohan Roy at Rangamati who has distributed it amongst his best cultivators for trial.

A separate report is submitted on the mycological work of the section. The most important pest under investigation is the *ufrà* disease of rice, which is being further investigated.

The Wahjain Tropical plantation remained under charge of the Economic Botanist. An account of the work done there will be found in the Annual Report of the plantation.

In addition to his own duties the Economic Botanist was also in charge of the work of the Arboricultural Expert from October 1910 to May 1911.

The 8th July 1911. G. P. HECTOR.

APPENDIX IV.

PROGRAMME OF THE DEPARTMENT FOR 1912-1913.

[*To be submitted to the Board of Agriculture at Pusa in November* 1911.]

As a general review of the work in progress a memorandum by His Honour, Sir Lancelot Hare, K. C. S. I., C.I.E., is republished :—

"Memorandum dated the 17th August 1911 by Sir Lancelot Hare, K.C.S.I., C.I.E., Lieutenant-Governor of Eastern Bengal and Assam, on the work of the Agricultural Department during the past five years, and programme of future work.

On the 16th February 1906 Sir Bampfylde Fuller recorded a memorandum on the programme of the Agricultural Department of Eastern Bengal and Assam, as settled in conference with the Inspector General of Agriculture. Five years have elapsed since then and Sir Lancelot Hare feels that the time has come to review the progress made and to consider the most advantageous lines for development in the near future.

The staff and preliminary work.

2. The superior cadre of the Department now comprises the Director, two Deputy Directors, a Chemist, Botanist Fibre Expert and Arboricultural Expert, each with a staff of assistants. The Chemist, Botanist and Fibre Expert have their headquarters at the laboratory on the Dacca Agricultural Station. The laboratory was opened for work in May 1910; its design, construction and fittings are excellent, and probably no building more suitable for scientific research work is to be found in India. The capital cost of the laboratory, including fittings and gas and water installations, exceeds one and-a-half lakhs of rupees.

Suitable residences have been constructed for the experts and other officers whose headquarters are at Dacca. Houses have also been provided at the other agricultural stations for the staff employed there.

Much of the time of the officers of the Department has been occupied in the erection of subordinates' quarters and other farm buildings, in the reclamation and laying out of the various farms, in the construction of roads and wells and other work of an engineering nature. Now that these preliminary operations have been almost completed, the technical officers of the Department will be more free to devote themselves to their proper functions.

Functions of the Department.

3. These functions may be summed up in the two words "Experiment" and "Dissemination". The Agricultural Stations are established for the purpose of testing new varieties of crops, new implements and new methods of cultivation suggested by theory or the practice of other countries as likely to give better results than those in common use in the Province.

Experiments.

4. A gradual increase of the experimental stations so as to cover the principal varying conditions of the Province must be made as money can be found. But at present the first development must be for purposes of demonstration, and it is not advisable to determine too long in advance at what new stations experimental farms shall be started.

Dissemination.

When an improvement has been discovered, it becomes the duty of the Department to bring it to the knowledge of the cultivating classes. This can be done to some extent by the publication of reports and leaflets; but ocular demonstration is the most effectual means of dissemination. No new crop, implement or method of cultivation should be considered a success unless the increased profits it produces considerably exceed the extra expense involved. Judged by this criterion the success of the following improvements has already been established by experiments on the Agricultural Stations :—

(i) the use of bonemeal manure for winter paddy crops on comparatively poor soil;

(ii) the occasional ploughing in of *dhaincha*, cow-peas or other leguminous crops on any soil that has been long under cultivation;

(iii) the use of the turnwrest plough, a strong implement that turns the soil completely over, for breaking up heavy new land;

(iv) the use of oilcake manure for sugarcane and potatoes;

(v) the three-roller iron mill for crushing sugarcane;

(vi) the superiority of Striped Mauritius over any variety of sugarcane cultivated in this Province;

(vii) the advantages of seed potatoes obtained from the hills for sowing in the plains;

(viii) prevention of disease in potatoes by spraying with Bordeaux Mixture.

District Agricultural Officers.

5. Though this list of definite successes may seem small, it cannot be doubted but that a very considerable advance will have been made when these improvements have been adopted into current agricultural practice. The first step to this end is to bring them to the knowledge of the cultivators. To attain this object proposals have been submitted to the Government of India for the constitution of a service of agricultural officers, and ultimately it is intended to appoint one such officer to every district. The first duty of these officers will be to study local agricultural practices and conditions with a view to deciding which of the improvements will be most appropriate and effective. They will then proceed to carry out the selected improvements on land borrowed from raiyats. During the progress of the work they will take all the most intelligent villagers into their confidence and explain to them the nature of the improvement, the expense incurred in carrying it out and the results obtained. For success in work of this kind practical skill and knowlege combined with sympathy and tact will be required. To ensure the necessary amount of practical experience the Lieutenant-Governor has decided that no district agricultural officer will be appointed till he has completed two years' practical training to the satisfaction of the Director. Appointments will generally be limited to graduates of an agricultural college.

Promising experiments.

6. In addition to the improvements already tested and proved, there are several promising experiments in progress on the Agricultural Stations, and it is confidently expected that the next five years will see the transfer of many possible improvements from the experimental stage to the category of established successes. The following instances of promising experiments may be mentioned:—

(i) improvement of poor high land soil by application of lime, with or without the addition of bonemeal;

(ii) cultivation of Sumatra and other foreign cigar tobaccos;

(iii) cultivation of cigarette tobaccos and curing by fire;

(iv) thinner planting of rice seedlings;

(v) the growth and storage of fodder crops to tide over the periods when fodder is scarce and for the improvement of cattle by adequate feeding.

When any new crop or method has been sufficiently tested and can be confidently recommended for general adoption, it will be taken up by the demonstrating staff.

Fieldmen Demonstrators.

7. To assist the district agricultural officers and to carry on demonstrations in districts where such officers may not have been appointed, a staff of less highly qualified fieldmen-demonstrators will be required. In the memorandum quoted above, Sir Bampfylde Fuller made provision for ten apprentices on the Dacca Agricultural Station, intending that these youths after two years' training should be appointed fieldmen demonstrators. Sir Lancelot Hare regrets to learn that, owing to the pressure of reclamation and engineering work, insufficient attention has been given to the agricultural training of the apprentices. It must be regarded as one of the most important duties of the Deputy Director and the Agricultural Supervisors to arrange that the apprentices are thoroughly trained in every branch of the work which a fieldmen demonstrator is expected to perform and there must be no hesitation in rejecting any who during the period of apprenticeship show themselves to to be unsuitable. With the introduction of district agricultural officers the training of probationers of this class will also be carried out at Dacca, and the Lieutenant-Governor recognizes and expects that the duties of training will henceforth occupy a considerable portion of the time of the Deputy Director of that station. For the training of apprentices the immediate responsibility will rest with the Agricultural Supervisors.

Jute.

8. On the subject of jute valuable preliminary work has been done. Mr. Finlow, Fibre Expert to this Government, working in colloboration with Mr. Burkill, Reporter on Economic Products to the Government of India, has established the fact that *Corchorus Capsularis*, the ordinary jute plant, is normally self-fertilised; the conclusion drawn from this fact is most important, *viz.*, that if any improved race is introduced into a district, only the most ordinary precautions are necessary to prevent it being contaminated by the inferior local varieties. The same experts have also shown that in regard to colour the jute plant follows the laws of Mendel, red being dominant and green recessive. Though colour of plant is not in itself of much importance, these results suggest the possibility that other characters which directly affect the quality of fibre may also be Mendelian. Of such characters the chief is the length of the minute filaments of which the fibre is ultimately composed. Investigation is now proceeding to determine the length of ultimate fibre in various races of jute, and the question of the extent to which ultimate fibre length is affected by environment and by heredity acting separately, forms the most pressing item of the Fibre Expert's work in the near future. This problem will obviously be of a far more complicated nature than that of the colour of plant, and it has been found necessary to construct a pot culture house as an adjunct to the Central Farm in order that plants of different races grown under various definite conditions of soil and moisture may be kept under observation together.

9. Though owing to the exceeding poverty of the soil the sugarcane experiments on the Jorhat Farm were at first very unpromising, the work done there by Messrs, Meggitt and Birt is now beginning to yield results of great interest and value. The qualities of different local and imported varieties are being carefully studied. Those which prove to be markedly inferior in regard to yield of sugar per acre, saccharose content of juice or susceptibility to disease, are being gradually eliminated. Most of those which now remain are the equal of almost any cane in the world. The object of future work should be to increase the yield by intensive culture, as has been done in Java, rather than to experiment with other new varieties. In addition to experiments in the permanent amelioration of the soil, the most suitable kinds and times for applying manure for the immediate requirements of the crop will be studied. A series of experiments has also been commenced to determine the best method of planting.

Sugarcane.

The work of the past three years has established the fact that by selecting for the next year's plants cuttings from the strongest, healthiest and best tillering clumps, a very marked improvement is effected in the yield of cane and juice.

10. The cultivation and subsequent treatment of Sumatra tobacco for cigar manufacture have been considarably improved at the new Agricultural Station at Burirhat near Rangpur. Successful experiments have also been made in the fire-curing of cigarette tobaccos. After the removal of some defects which still remain, the Department should be in a position to lay down definite instructions for the production of cigar and cigarette tobaccos of good qualities, according to the standard of the European market, and should be prepared to distribute large quantities of standard varieties of seed of these two kinds.

Tobacco.

11. The Economic Botanist has taken up the study of the varieties of *aus* and winter rice most commonly cultivated in this Province. As the work has only been a short time in progress no results can be expected yet, but it is hoped to discover new races which will be improvements on the existing races in respect of heaviness of yield, tillering power, stiffness of straw and other desirable qualities.

Rice.

12. As the result of some seven year's experience it is concluded that no variety of potato remains immune to blight in the Khasi Hills. Sutton's Magnum Bonum (which is almost identical with the variety of potato grown around Nainital) resists the disease better than any other kind, but after a few years its resistance becomes gradually weaker. The only means by which potato cultivation is to be maintained in the Khasi Hills is that the Department should annually import a large quantity of the most immune variety obtainable in Europe, multiply the tubers by a year's cultivation and distribute the produce as seed throughout the hills. For this purpose it will be necessary to extend considerably the area under cultivation at the Upper Shillong Farm.

Potatoes.

13. Through the medium of the Fruit Experiment station, strawberries, mulberries, rhubarb and asparagus have been introduced to some extent into ordinary cultivation around Shillong, and though but little success has been gained with other English fruit, it has been decided to continue the experiments for some time longer, paying attention to the provision of shelter belts of trees and to the selection of stocks and scions of varieties which mature either before or after the heavy rains. Experiments with fruit trees have recently been commenced at Dacca by the Economic Botanist and should lead to an extension of this generally neglected form of husbandry. The tropical plantation at Wahjain has been abandoned, as it did not prove successful. The growing of fodder crops for the cold weather months requires special attention at all the Agricultural Stations.

Other crops.

14. There is one apparently serious disadvantage in the site chosen for the Dacca Agricultural Station, namely, the exceeding infertility of the soil. In some respects, however, this is an advantage; for the soil is typical of that found extending over wide areas in Dacca and many other districts; the soil of the Jorhat Farm is also very similar in character. Analyses of these soils show that they are very deficient in lime and phosphoric acid and that they have an acid character which is inimical to the bacteria which do so much to promote ordinary plant life. Raiyats find it impossible to get good returns from such land and rabi crops can scarcely be grown at all. It will therefore be obvious that a practical solution of the problem of the appropriate treatment for this type of soil will be a very great boon to the province. Experiments at Dacca and Jorhat have already shown that dressings of lime and bonemeal, with occasional green-manuring, effect an immediate improvement. Further experiments are now in progress to determine the quantities and doses in which the lime and bonemeal are to be applied to effect the most complete and permanent improvement. Nothing that the Agricultural Department has in hand is of greater importance than this problem.

Soil improvement.

15. The Lieutenant-Governor's orders in regard to measures for the general betterment of cattle have been issued separately. On this occasion, Sir Lancelot Hare desires only to point out that improvement is necessary in the type of house provided for the accommodation of cattle. At every Agricultural Station in this Province there should be a model cattle shed combining the maximum provision for the health and comfort of the cattle with the efficient conservation of manure, at a minimum cost, well within the means of an ordinary raiyat. According to the site, to the materials most readily available locally and to the varying climatic conditions, a different type of shed will probably be required for each farm, and it will rest with the Deputy Director and his subordinates to discuss the matter with local cultivators and officers and, having ascertained local conditions, devise a model cattle shed.

Housing of cattle.

16. The work of the Bengal Silk Committee in Rajshahi, Malda and Bogra has been taken over by Government; all the existing institutions have been maintained and a large seed-rearing establishment has been opened at Mirganj on the bank of the Ganges. In April last, Mr. Fletcher, Imperial Entomologist, inspected all the sericultural stations and has submitted a report which is now under consideration. In accor-

Sericulture.

dance with his advice, it is proposed to continue the production of disease-free seed and, as soon as there are indications that the demand for such seed is more than the existing seed-rearing stations can supply, to open a new one in the Malda district. The Imperial Entomologist has kindly undertaken that experiments in breeding a superior hybrid race of multivoltine silkworms will be made at Pusa. All expenses connected with the Sericultural School at Rajshahi are now borne by Government, but the management is still vested in a local committee. Owing chiefly to the difficulty of finding a competent master, the school has not been a great success. Ultimately it may be found necessary to give it a more practical character by attaching it to one of the seed-rearing stations.

Entomology and Mycology.

17. For the study of the insect pests and the fungus diseases of crops, the Department has at present only two Collectors on pay of Rs. 50—$\frac{5}{2}$—75 a month. The Lieutenant-Governor recognizes that this provision is inadequate for operations on the large scale which alone can be effective. Officers are required with high training, active intelligence and tact to secure the willing co-operation of large bodies of raiyats. When such officers are available, the Lieutenant-Governor will be ready to move the Government of India to sanction the appointment of an Entomological Assistant and a Mycological Assistant on a suitable salary, which may perhaps be intermediate between that of a Farm Superintendent and an Agricultural Supervisor.

Additional staff requirements.

18. The additional staff required by the Department includes two more Agricultural Supervisors, the Entomological and Mycological Assistants just mentioned, a second Superintendent of Sericulture when a new seed station is opened in Malda district and a number of fieldmen demonstrators. Sir Bampfylde Fuller estimated that twelve fieldmen demonstrators would be required to begin with, but although six passed apprentices are now acting temporarily in this capacity, none of them are yet sufficiently trained to be worthy of permanent appointments. Now that all the Agricultural Stations are in regular working, a sufficient number of trained demonstrators should soon be available. The Lieutenant-Governor has regretted to notice that the amount of work done by Associates during the past five years is not very considerable, but recognizes that this is largely owing to the want of supervising officers; he hopes, however, that this want will soon be supplied.

Associates and Co-operative Societies.

19. In addition to assisting Associates, the Lieutenant-Governor desires that the services of demonstrators may be occasionally lent to Co-operative Societies, the members of which show keenness in introducing agricultural improvements. In this connection, Sir Lancelot Hare considers that the greatest benefit is to be expected from close communication and active mutual assistance between the Registrar of Co-operative Credit Societies and the Director of Agriculture.

To this it is only necessary to add that in regard to improvement of cattle, the Government has ordered a complete survey to be made of the working and milch cattle of the province and of the conditions affecting their breeding and maintenance. This work will be taken up as soon as an officer can be found competent to make the enquiry. In regard to poultry improvement, considerable success has attended the efforts to introduce good breeds into the Lushai Hills and arrangements are being made to develop this work and to extend it to the Khasi and North Cachar Hills. Substantial progress has been made with the breeding of a good stamp of poultry suitable for raiyats in the plains. The central breeding station at Dacca is under the charge of Mr. Meggitt and arrangements for starting subsidiary stations are being completed.

II.—PROGRAMME OF THE DEPUTY DIRECTOR OF AGRICULTURE, DACCA.

[A .G. BIRT, B. Sc.]

The Deputy Director of Agriculture is in charge of the following:—

1. Dacca Agriculture Station, Eastern Bengal.
2. Burirhat „ „ „ „
3. Rajshahi „ „ „ „
4. Jorhat „ „ Upper Assam.
5. Central Seed Depôt, Dacca.
6. Demonstration work in the southern parts of t e Province.
7. The Entomological section.

1. Dacca Agricultural Station.

The work at this station has in the past been mainly of a preparatory nature. Much time was necessarily taken up in clearing and laying out the land, the greater portion of which was originally jungle.

The soil of the high land having proved to be extreme'y uneven in character, the laying down of large areas under experiment has been up to the present impracticable. However, a certain amount of preliminary work has been done, and this, together with future lines of work, will be described in the following paragraphs:—

Investigations into the improvement of the soil of the highland areas in collaboration with the Agricultaral Chemist.—Preliminary experiments indicate that the application of lime and bonemeal in conjunction with green manuring effects a very great improvement in the soil both physically and chemically. Two series of experiments have therefore been laid down this year in duplicate on four acres of typical high land, the object being to study the effect of lime in large and small doses used alone and in conjunction with bonemeal and cowdung. One series will include green manure in the rotation every second year. This experiment has been laid down for six years.

In connection with the above experiments it is proposed to commence a series of cultivation experiments to ascertain how far the water-holding capacity of the soil in the cold weather can be improved by deeper ploughing and thorough surface cultivation.

Winter paddy.—The experiments in progress include manuring, transplantiug and spacing. Results obtained up to date indicate that solutable manures such as Saltpetre, Calcium Nitrate, Sulphate of Ammonia, etc., are not profitable owing to their liability to be washed out by flood water. The best results have been obtained from the application of small quantities of bonemeal and by the ploughing in of green manure crops.

With regard to transplanting experiments the results indicate that a considerable reduction in the number of seedlings per acre can safely be made without danger of diminution in outturn.

Future work will consist in further experiments with bonemeal and green manures with and without the application of lime, the more soluble artificials being excluded as unsuitable under the prevailing conditions ; the continuation of the planting experiments with special reference to the seed rate in the seed-bed and the effect of early and late planting on the quantity of seedlings required ; and the growing of fairly large areas of selected varieties for seed distribution.

Sugarcane.—A small area of the local variety of cane put down two years ago having done remarkably well, several varieties (including Striped Mauritius, Tana and Barbadoes varieties) were brought down last year from Jorhat (Upper Assam) and planted along side the local varieties. The results were so encouraging that this year we cut up the greater portion of the crop for sets and planted about five acres. It is proposed to compare the yields of the imported varieties with that of the local variety this year for the first time. Future work will depend largely on the results obtained. If the yields indicate that sugarcane is likely to prove a profitable crop on this type of soil, regular trials of varieties will be made and the question of method of planting and manuring will be gone into.

Green Manures.—Work on green manures is being carried out with the Agricultural Chemist and the Economic Botanist. Investigations made up to the present prove that *dhaincha* (Sesbanea aculeata) is superior to sunn (Crotolaria juncea) on both high and low land on account of weight of green matter and nitrogen per acre, and also rate of decay when ploughed in.

It is proposed to extend the work to include other leguminous plants found growing wild in the locality. Up to the present we have not found an ideal plant for the green manuring of winter paddy on low land. Dhaincha has been used up to date, but its growth is arrested by water-logging, and the weight of plant ploughed in is comparatively small. Our aim is to discover a plant which will stand a certain amount of water-logging in its earlier stages.

Fodder crops.—Joar (Sorghum) has proved to be the best fodder crop for the rains, but as grazing is abundant during that season, our efforts are being mainly directed to discovering a crop which would come in during the cold weather. We have tried sowing several crops, for example *Khesari* (Lathyrus sativus) and sunn on the winter paddy and as catch crops to come on after the paddy is harvested, but up to the present time have not been successful. This is practised to a very limited extent in some parts of the Province and is worthy of very much wider application, if suitable crops can be found and the right time for sowing ascertained. Experiments with this object in view will be continued.

Trials of Implements, etc.—A considerable number of implements new to the Province, including Ransome, Meston and Hindustan ploughs, Planet Jr. horse hoes and hand hoes, bullock hoes, chain pumps, etc., are under trial on the Farm. As a result of these trials we have been able to recommend the Ransome and Meston ploughs and the Planet Jr. hand hoe and there is now a small demand for these implements.

The Ransome plough has been found very suitable for breaking up stiff land and also for ploughing in green manure crops. Several zamindars and large cultivators have obtained ploughs through the Department.

The work of testing any new implements which are put on the market will be continued and those found suitable for local conditions will be stocked and supplied to cultivators.

Training of Students and Apprentices.—A course of training in practical agriculture is being given to three students who passed through the Poona Agricultural College, with the object of fitting them for the post of District Agricultural Officer. The period of training extends to two years, and it is proposed to have not more than four students under training at the same time. The men selected for training will be graduates of a Provincial Agricultural College.

The training of cultivators' sons for the post of demonstrator is being continued. Up to the present four men have completed their two years' training at Dacca and have been given temporary appointments as demonstrators on Rs. 20 per mensem. Eight men are still under training, four in their first and four in their second year.

2. Burirhat Agricultural Station.

The principal crop under experiment is tobacco. There are also minor experiments with groundnuts potatoes, fodder crops and green manure crops, and also an experiment to test the effect of lime in conjunction with green manure on this soil.

Tobacco.—Experiments on the growing and curing of exotic varieties of tobacco have been carried out on this farm during the last three years. The object aimed at is two-fold—the production of a leaf suitable for cigar wrappers and the production of tobacco suitable for the manufacture of good class cigarettes.

At first we were not very successful, but during the last two years, with careful cultivation and better methods of curing, we have undoubtedly produced superior grades of tobacco which at the present time find a ready sale in the Indian market at prices four to five times that obtained for the ordinary local country tobacco. For cigar leaf the variety being experimented with is Sumatra. This year we grew 1 acres which gave a yield of 18 maunds 5 seers of cured leaf. This was sorted into four grades A, B, C and D, according to size and quality of leaf, and grades A, B and C were sold to a Madras Firm at the following prices. Grade D was not valued, as it was considered useless for wrappers.

	Quantity. Mds,	Seers.	Price.			
Grade A ...	10	20	at Re. 1-4-0	per lb. = Rs. 102-8	per md. (of 82 lbs.)	
„ B ...	8	30	„ „ 1-0-0	„ = „ 82-0	„	„
„ C ...	2	25	„ „ 0-12-0	„ = „ 61-8	„	„

The total amount realised being Rs. 1,545 for $1\frac{1}{10}$ acres. Against this the total cost of cultivation and curing (exclusive of rent of land and supervision) was only Rs. 246-9-9.

For the production of cigarette tobacco the chief varieties grown are American, but we have also tried several Turkish varieties. The curing of this class of tobacco at Burirhat has been much improved by the introduction of fire-curing, the object being to produce tobacco of a light colour and mild flavour.

The bulk of this year's fire-cured-tobacco has not yet been sold, but for a small quantity of Turkish cigarette tobacco (about 1 maund) we have obtained Rs. 85 per maund for the first grade and Rs. 65 for the second grade from a firm in Bombay.

The above results are decidely encouraging. No doubt the high prices obtained for the above are due to some extent to the import duty on tobacco, yet it is obvious that manufacturers would not buy our tobacco if it were not suited to their purposes, whatever the import duty might be.

The present lines of work will be continued with the object of producing the best possible Sumatra leaf by suitable cultivation and curing. For cigarette tobacco we have imported seed of White Burley from America and a fairly large area of this variety will be grown for further experiments in fire-curing.

Other Experiments.—Groundnuts and potatoes have been tried on a small scale with indifferent results. Both these crops are liable to disease on this farm. Groundnuts will be planted wider between the rows next year so that more interculture can be given.

Cow-peas and *dhaincha* are being tried as green manure crops and both do exceedingly well.

Jear has proved to be an extremely useful fodder crop in the rains and earlier part of the cold weather.

For winter fodder, a small area of Guinea grass has been put down for trial.

The soil having been found extremely poor in lime, an experiment to test the efficacy of lime applied in small doses annually in conjunction with green manuring has been laid down at the instance of Mr. Meggitt. It is proposed to grow tobacco annually on one of the lime plots to study the effect of the lime on the quality of the tobacco.

3. Rajshahi Agricultural Station.

Experiments at Rajshahi include sugarcane, jute, potatoes, winter paddy and groundnuts.

Results up to date show that the Dacca *gandari* variety of sugarcane is superior to the local variety in quality of juice and yield of sugar per acre, but its germinating power and resistance to water-logging is inferior, and this is a serious drawback to it in a locality like Rajshahi where there is likely to be shortage of moisture at planting time and excess of water during the rains.

Work with jute now consists in growing fairly large areas of varieties selected by the Fibre Expert for seed.

Experiments with potatoes have demonstrated the superiority of the Darjeeling variety and have shown that with careful cultivation a crop of two hundred maunds or more per acre can be grown without irrigation.

Manurial and planting experiments with winter paddy have not been successful owing to the difficulty of controlling the water-supply. Groundnuts have proved a failure owing to water-logging.

As a portion of the farm is to be taken up for the construction of a railway, it is proposed to abandon the place as an experiment station. At present the drainage system in the vicinity of the farm is in a very bad state and the land is liable to sudden floods in the rains.

After the construction of the railway and the improvement of the drainage it is proposed to make the farm the headquarters of the District Agricultural Officer, who will use the land for demonstration purposes.

4. Jorhat Agricultural Station.

The two chief lines of work at Jorhat are experiments with sugarcane and investigations into the treatment of the soil, both of which are being done with Mr. Meggitt, Agricultural Chemist.

There are also minor experiments with groundnuts and potatoes.

Sugarcane.—Experiments during the past three years have shown that the Striped Mauritius variety is superior in all respects to the local varieties, and that some varieties imported from Barbadoes are also suitable for this locality.

Our future lines of work will be the further testing of varieties, trials of various methods of planting with the superior varieties, and manurial trials with the object of economically raising the outturn of sugar per acre.

Soil improvement expriments.—This work is being conducted on very similar lines to that at Dacca, the soils of the two places being very similar in some respects, notably their poverty in lime and phosphate. The Jorhat soil is, however, very much better physically than the Dacca soil, being more retentive of moisture in the cold weather and lighter in texture.

Preliminary experiments showed the marvellous effect of lime on this soil and consequently liming has been made the basis of the experiment. It is being applied in varying quantities with and without bonemeal and cowdung, while green manuring is being introduced into one series of plots.

The experiment has been laid down for six years.

Groundnuts—Have grown well during the last two years, but great difficulty is found in protecting them against rats. It is proposed to continue experiments with this crop and, if it proves a financial success and a local market can be found, to induce cultivators to take up its cultivation.

Potatoes—Have been successfully grown on a small scale as a demonstration rather than as an experiment in order to introduce the crop to the locality.

5. Central Seed Depot, Dacca.

The seed depôt was started about three years ago with the object of supplying pure seed of high germinating power to the general public. Up to the present the demand for such seed has not been large, but it is gradually increasing as the depôt is becoming better known.

The chief work of the seed depôt up to the present has been to stock seed of crops new to the Province and also special varieties of crops grown in certain parts of the Province for which there is a demand in other districts.

In this way quantities of potatoes, and special varieties of jute and paddy seed have been distributed. Improved implements are also distributed from the depôt. In future the chief duty of the depôt will be to distribute special varieties of seed recommended by the Department.

6. Demonstration Work.

A commencement has been made with demonstration work on the use of bonemeal for paddy in the Dacca district, and this work will be further extended in future. The demonstrations are being carried out on cultivators' holdings by four demonstrators under the supervision of an Agricultural Supervisor.

The results obtained on the *aus* paddy crop were in some cases astonishing, increases of more than 100 per cent. being recorded by the use of 3 maunds of bonemeal per acre. The effect will also be measured on the winter paddy crop.

Potato demonstrations in four districts, *viz.*, Dacca, Mymensingh, Rajshahi and Pabna, are being carried out during the present cold weather.

Demonstrations in the Assam Valley will be commenced with the object of introducing the Striped Mauritius variety of sugarcane and the cultivation of potatoes to the notice of cultivators.

While on tour the demonstrators will show the use of improved implements such as the Meston plough and Planet Jr. hoe in the cultivation of the crops to be demonstrated with.

As far as possible, advice and help will be given to agricultural correspondents and others who wish to make experiments on their own account.

7. Entomological Section.

At present we have only a Collector on Rs. 50 to 75. His time is largely taken up in visiting places from which reports of insect attack are sent in.

Two special pieces of work are in progress and will be continued; one is the prevention of the mango weevil and the other the investigation of the disease of paddy termed "ufra." The result of our investigations into the disease up to date tend to confirm our suspicions that in some places it is caused by insect attack and in other places by a fungus.

III.—PROGRAME OF THE DEPUTY DIRECTOR OF AGRICULTURE, SHILLONG.

[J. N. Chakravarty, B.A., M.S.A., Agricultural Supervisor in charge].

1. Upper Shillong Farm.

Potatoes.—Trials of new varieties will be continued. Past experience having shown that it is impossible to keep any variety altogether free from disease, fresh seed of the variety which has so far proved to be most immune will be imported from England and grown on as large a scale as practicable for sale as seed. The experiments contrasting (1) cut sets—*v*—whole sets and (2) methods

of planting, will be continued. The manurial and spraying experiments having given definite results have been discontinued. The experiment in planting sprouted tubers was abandoned having yielded no useful results. A new experiment has been started to compare summer grown with winter grown seed, the usual local practice being to save seed from the summer grown crop ; this will be continued.

Fodder crops.—Maize.—New varieties will be tried and improvements in cultural methods (use of drills for sowing and of bullock hoes for interculture) will be attempted.

One of the local grasses U Langtylli has proved a good fodder crop and its cultivation will be extended. *Euchleana Mexicana* and other new fodder crops will be tried.

Soybean.—Different varieties are being grown for trial.

Treatment of soils.—There is a large area of marshy land on the Farm which is being gradually reclaimed by draining. An experiment to test the effect of liming will be tried on a small scale.

Cattle-breeding.—The breeding of Patna bulls for the Khasi Hills will be continued.

Sheep-breeding.—The crossing of Khasi ewes with Dumba rams has already given encouraging results and this will be continued on a larger scale.

2. Rangpur Demonstration Farm.

This farm has been taken over by Government from the 1st August from the local Agricultural Association and is to be used primarily as a demonstration and seed farm. Improved varieties of jute, paddy, potatoes and sugarcane are to be grown for demonstration and seed. Growing of cow-peas for green manuring will be continued.

Sugarcane.—Striped Mauritius, striped and yellow Tana and Dacca *gandari* will be compared with the local sugarcane ; joar, oats and peas will be grown for fodder and an attempt will be made to introduce these crops among the raiyats.

3. Fruit Garden, Shillong.

Experiments to test the suitability to the Khasi Hills of various kinds of fruit trees grown in temperate climates will be continued. Special attempts are to be made to develop suitable varieties by grafting foreign varieties on native stocks and by selection.

Sericulture.—The rearing of European silk-worms will be continued. Three Khasi boys trained at Rajshahi at Government expense are expected to start rearing on their own account during the next two years.

4. Demonstrations.

The main feature under this head is the appointment of a District Agricultural Officer for Rangpur during the present year. It will be the first duty of this officer to study closely the agricultural conditions of the district and then to demonstrate on rayats' holdings improvements recommended by the Department. He will spend most of next year in making an agricultural survey of the district. Demonstrations commenced by the Agricultural Association will be continued, including the introduction of Dacca *gandari* sugarcane and the advantages of green manuring for potato cultivation.

In the Khasi Hills previous demonstrations of the use of bonemeal (without the addition of any soluble manure) as a fertiliser for winter paddy have yielded encouraging results and this work will be continued on an extended scale. The benefit of spraying potatoes with Bordeaux Mixture will be further demonstrated. The grafting of fruit trees is being taught to owners of orchards in the Khasi Hills and will be continued. The trial of Buri cotton in certain Hill Tracts will be continued.

IV.—PROGRAMME OF THE FIBRE EXPERT.

[R. S. Finlow, B. sc., f.c.s.]

Short account of work completed or in progress.—In collaboration with the Reporter on Economic products :—

(*a*) The preparation of a final account of the classification of the races of jute is almost complete and will be published at an early date.

(*b*) An account of the results so far obtained from experiments in the cross-fertilisation of jute is now ready for the press.

2. The experiments with the object of investigating the possiblity of the improvement of jute by selection were continued during the year. Previous results showed considerable differences, chemical and microscopical, between the fibre produced from different races grown in the same field, and it seemed possible that a method of selection might be based on these differences. Later results, however, indicate that the effect of soil, climate, etc., both on the chemical composition and on the microscopical structure of the fibre, may also be considerable. The observed variation in chemical composition due to one or both of these causes, in the case of jute, amounts to 9 per cent. of cellulose or about 15 per cent. of the total cellulose content of the fibre. Poteulture trials are now being carried out with the object of definitely deciding whether variation in composition of the fibre is entirely caused by environment or whether a portion of it is due to a hereditary capacity in some plants for producing superior fibre. It is interesting to note that C. D. Mell, *vide* American Forestry, Quarterly, Volume VIII, No. 4 has observed similar differences in the microscopical structure of the wood of Californian forest trees. In the abovenamed journal he quotes results obtained for the wood of the Californian Walnut (Juglans Californica).

3. (*a*) Preliminary trials on a small scale with flax in Assam have given encouraging results as regards both straw and grain, and it is now practically certain that a block of about 5 acres will be put down at Paihata in the coming season.

(*b*) A set of plots designed to throw light on the manurial requirements of flax was, with the approval of the Inspector-General of Agriculture, laid down at Pusa in the season 1910-1911. The series included farm yard manure, green manure and mineral fertilizers. Unfortunately the appearance of dodder has rendered it advisable to discontinue the cultivation of flax at Pusa for a time, but the work may be continued at Dooriah.

(*c*) No time has been available for systematic work on the remaining items in the last programme submitted to the Board. It has, however, been possible to make certain observations on the conditions affecting the speed of the process of retting, in the extraction of fibres like jute, flax, sunn, hibiscus, etc. Some useful information has also been gained regarding possible sources, in Assam, of material suitable for paper-making.

PROGRAMME OF WORK.

(*a*) The preparation of a monograph on jute will occupy a considerable amount of time.

(*b*) In collaboration with Mr. Burkill, the experiments in the hybridisation of jute will be continued and, if possible, brought to a conclusion.

(*c*) The work described in paragraph 2 above will be continued, with the view of completing the investigation into the possibility of improving jute, and other bark fibres, by selection.

(*d*) The extension of flax cultivation into Assam will receive attention.

(*e*) The following items which have appeared in former programmes will be taken up systematically as soon as opportunities occur :—

(1) Study of retting of jute.

(2) Investigation of heart damage in jute.

(3) Investigation of sources of material for paper-making.

V.—PROGRAMME OF THE AGRICULTURAL CHEMIST.

[A. A. MEGGITT, B. Sc.]

1. *Work on sugarcane in collaboration with Mr. Birt will be continued.*—Up to the present the work has consisted chiefly of varietal trials with the object of finding varieties superior to the local canes and suited to local conditions.

As a result of very careful comparative study along several lines, *e.g.*, weight of cane per acre composition and purity of juice, germinating power, relative rate of growth, ratooning and tillering powers, comparative rate of ripening, uniformity of ripening amongst individual varieties, freedom from disease, tendency to split or excessive lodging, we find that the variety best suited to the conditions under which we are working is Striped Mauritius, followed closely by some of the Barbadoes seedling canes.

Striped Mauritius is being actively disseminated, while the distribution of other varieties is being pushed as their suitability is proved. We are now instituting planting experiments, with which will be combined later on manurial work, the object being to increase the outturn per acre as far as such is distinctly profitable. We are convinced that the problem of close *versus* wide planting of cane is intimately connected, especially on poor soil, with the manurial treatment.

2. *Investigation of local soil problems with Mr. Birt.*—Many large tracts of soil in Eastern Bengal and Assam present interesting and peculiar characteristics, being very deficient in calcium carbonate, acid in character, often extremely poor in total as well as available phosphoric acid, and more or less deficient in nitrogen and organic matter. It is extremely difficult on such land to grow cold-weather crops, and though this is connected in some cases with lack of moisture, this is not the only cause. Special studies are being made with regard to reaction, chemical and physical characteristics, with a view to the general amelioration of these soils. Their requirements for lime, phosphoric acid and organic matter, with special reference to the correction of acidity where it exists, and to the improvement of their permeability in some cases, and the retentive capacity for moisture during the cold-weather months, are being worked out, and field experiments on a large scale have been laid down in this connection.

Results to date show that the effect of adding lime and phosphoric acid as bonemeal, and the incorporation of green manure, has proved to be pronounced on the *rabi* cropping, the effect of lime alone in some cases being to produce an 8 to 12 annas crop where none would grow at all before. Extreme poverty in calcium carbonate and phosphoric acid would appear to be the chief limiting factors in many of our soils.

In some cases the effect of green manuring without lime, while showing an improvement in cold-weather cropping, has not been great as might have been expected. Relative to field work, laboratory work will be undertaken to determine the effect of the manures used on crop composition, in connection with a study of the requirements of various crops and removals of plant food, and the subsequent adoption of suitable rotation, and that form of manurial practice best calculated to supply crop demands at the least cost, while leading up to the soils, general and permanent amelioration.

3. *Work on some phases of the problem of green manuring with Messrs. Birt and Hector.*—In connection with our soil problems, we require green manure crops to meet various conditions, *e.g.*, of soil, of period and season of growth, of power to resist water-logging, etc.

So far this work has been confined to a study of two crops *dhaincha* (Sesbanea aculeata) and sunn hemp (Crotolaria juncea), the lines of comparison being weight of green matter produced per acre, weight of dry organic matter, weight of nitrogen contained in the crop, root range and comparative nodule development, facility of incorporation with the soil, and relative rate of decay after ploughing in. Results to date show that both do well, but that *dhaincha* in Eastern Bengal easily leads on all counts.

This work will be extended to other green legume crops to meet various requirements.

4. *Work on the nutrition of the winter paddy crop.*—Object; to ascertain its food requirements and the period of growth during which the individual food factors are chiefly required and absorbed The crop lives its life under such extraordinary conditions as regards water that any manurial work to be done must be very carefully considered to ensure the most economical use of the manure used. I propose to study the matter from a series of samples consisting of entire plants taken throughout the whole growing period of the crop from typical winter paddy land normally producing a good average outturn per acre.

5. *The Kadamara disease of paddy will be considered.*—This disease causes much loss in certain parts of the province and is apparently due to acidity as a result probably of excessive Butyric fermentation in the presence of much organic matter, a deficiency of calcium carbonate and insufficient æration.

After the necessary chemical examination, remedial measures based upon it will be proposed.

6. *Routine analytical work.*

VI.—PROGRAMME OF THE ECONOMIC BOTANIST.

[A. G. BIRT, B.Sc., IN CHARGE.]

1. The laying out of about 14 acres of land as a Botanical area has been completed. About 4½ acres is reserved for fruit, while the remainder is intended for the cultivation of the various crops under investigation. A six-feet diameter pucca well has been sunk to irrigate the fruit area and it is proposed to construct two more similar wells as funds are available.

2. *Rice.*—A collection of the more important varieties of *aus* and *aman* rice in the province has been made and these are being grown for selection work. This work will be continued, selection being made on the single plant system with the object of isolating superior races.

3. *Tils, mustard, pulses and chillies.*—A survey of these crops is being made, and for this purpose a large number of varieties of each have been collected from all parts of the province.

4. *Fruit.*—Experiments have been commenced with the object of determining what fruits can be grown successfully in Dacca district.

The following fruit trees have already been planted out in the fruit area :—

1. Mangoes	...	6 varieties.
2. Lichis	...	4 „
3. Guava	...	1 variety.
4. Pomelos	...	2 varieties.
5. Limes	...	2 „
6. Citrus	...	2 „
7. Custard apple	...	1 variety.
8. Bullock's heart	...	1 „
9. Pine-apples	...	7 varieties.

A large number of several varieties of citrus stocks are being brought from the Khasi Hills for orange budding experiments. As most varieties of citrus have been found to be immune to the orange disease which is rife in the Khasi Hills, the object of the budding experiments is to find a suitable stock on which to bud oranges, which it is hoped will then be also more or less immune to the disease.

5. *Green manure plants.*—In collaboration with the Agricultural Chemist and Deputy Director of Agriculture investigations as to the suitability of various plants for green manure are in progress.

In this connection a large number of leguminous plants, both cultivated and wild, are being grown for observation. This work will be continued.

6. *Herbarium.*—A commencement has been made to form a reference herbarium of the more important cultivated and wild plants of the province. The collections will be gradually extended.

7. *Mycology.*—At present the staff consists of the Collector on Rs. 50 to Rs. 75. He is chiefly engaged in collecting specimens of fungi, which are forwarded to the Imperial Mycologist.

Special investigation will be made into a disease of paddy termed "ufra" and also a betel-nut palm disease which has recently appeared in the Goalpara district.

APPENDIX V.

List of Honorary Correspondents of the Department of Agriculture in Eastern Bengal and Assam.

(The names of correspondents who are also Associates are marked *.)

DACCA.

1. Rai Hara Sankar Chaudhuri, Teota.
2. Maulvi Abdul Karim Sarkar, Post Office Ramnagar, Dacca.
3. Babu A. K. Chatterjee, Murapara.
4. Babu Surendra Narayan Podder, Kalakopa, Nawa'ganj Post Office.

MYMENSINGH.

5. Babu Chandra Kishore De, Rasulpur, Post Office Sibganj.
6. Babu Iswar Chandra Guha, Jamalpur.
7. Babu Bepin Behari Baksi, Kantaliya.
8. Hazi Meah Bepari, Merchant, Bhairab Bazar.
9. Rai Prasanna Kumar Chakravarty Bahadur, Zemindar, Dhalla.

FARIDPUR.

10. Babu Kali Prassanna Sarkar, Faridpur.
11. Mr. S. M. Bose, Gopalpanj.

BAKARGANJ.

12. Babu Satya Ranjan Gupta; c/o Dr. T. K. Gupta, Barisal.
13. Babu Joges Chandra Sen, Barisal.

CHITTAGONG.

14. Raja Bhuban Mohan Roy, Chittagong.
15. Babu Iswar Chandra Nandi, Fatehabad, Chittagong.
16. Dwija Das Dutt, Esq., Chittagong.
17. Sadr Khas Tahsildar, Chittagong.

TIPPERA.

18. Babu Anukul Chandra Roy, Manager, Bhukailash Raj Ward's Estate, Comilla.
19. Babu Borada Sundar Pal, Manager, Estate of the Hon'ble Syed Hussam Haidar Chaudhuri, Khan Bahadur, Zemindar, Comilla.

NOAKHALI.

20. Babu Ananda Chandra Roy, Zemindar, Gobindapur, Laksham, Assam Bengal Railway Noakhali.
21. Babu Abhoya Charan Bose, Naib, Amirabad Zemindari, Chaumohini.

RAJSHAHI.

22. Babu Kishori Mohan Chaudhuri, Rajshahi.

DINAJPUR.

23. Babu Purna Chandra Sinha, Raiganj, Dinajpur.

RANGPUR.

* 24. Babu Ashutosh Lahiri, Rangpur.
* 25. Babu Rajani Kanta Bhattacharjee, Rangpur.

BOGRA.

26. Babu Baidyanath Sanyal, Bogra.
27. Babu Jogendranath Sarkar, Post Office Madla, Bogra.
28. Babu Kasi Nath Das, Bogra.

PABNA.

29. Babu Prasanna Narayan Chhudhuri, Government Pleader, Pabna.

MALDA.

30. Babu Ashutosh Misra, Post Office Harischandrapur.

SYLHET.

31. D. Ferguson, Esq., Dhamai Tea Estate, P. O. Dakhinbhag, Sylhet.
32. Babu Girija Nath Biswas, P. O. Kanairkhal, Jagannathpur, Sylhet.
33. Babu Har Kishore Gupta, Post Office Pail, Habiganj.
34. Babu Satis Chandra Deb, B.L., Karimganj.
35. Babu Pabitra Nath Das, Post Office Beani-Bazar, Sylhet.
36. Babu Amar Nath Roy, B.A., Sunamganj, Sylhet.
37. Babu Ambica Charan Bhattacharyya, Post Office Lauta, Sylhet.

KHASI AND JAINTIA HILLS.

38. U Job Solomon, Cherrapunji.
39. U Kubur Singh, Mylliem, Shillong (Post Office).

GOALPARA.

40. Babu Dijes Chandra Chakravarty, Manager, Gauripur Estate.
41. Babu Lalit Mohan Dutt, Dhubri.

KAMRUP.

42. Rai Saheb Chidananda Chaudhuri, Gauhati.
* 43. Babu Mahendra Mohan Lahiri, Gauhati.
44. Munshi Tayab Ali, Beltola, Kamrup.

DARRANG.

45. Babu Syama Charan Maitra, Tezpur.

NOWGONG.

46. Babu Jnan Chandra Roy, Baithalungso, Post Office Kampur.

SIBSAGAR.

* 47. Babu Akshay Kumar Ghose, Sibsagar.
* 48. Srijut Debeswar Gossain, Barpathar Sugarcane Farm (Golaghat), Post Office Badlipar.

APPENDIX VI.

Issues of seeds, plants, manures and implements from the Seed Depôt during 1910-11.

	Mds.	srs.	ch.
Seeds.			
1. Paddy	250	39	0
2. Peas	0	5	0
3. Oats	0	5	0
4. Mustard	0	20	0
5. Groundnut	2	20	8
6. Joar	1	27	0
7. Arhar	0	1	8
8. Maize	2	10	0
9. Buri cotton	1	3	8
10. Jute	63	37	8
11. Potatoes (Nainital)	102	10	0
12. Potatoes (Darjeeling)	102	2	8
13. Potatoes "King of Potatoes"	1	20	0
14. Mahua	60 Nos.		
15. Inga dulcis	0	20	0
16. Dhaincha	87	22	8
17. Sunn Hemp	12	15	0
	629	19	0
Plants, cuttings, etc.,			
18. Plantain shoots	420	0	0
19. Sugarcane cuttings	11,465	0	0
20. Mango grafts	56	0	0
	11,941	0	0
Manure.			
21. Bonemeal	0	1	0
Implements.			
22. Planet Junior Hand Hoe	8		
23. Turn Wrest Plough	4		
24. Hindustan Plough	1		
25. Meston	1		
26. Horse Hoe No. 8	2		
	16		

APPENDIX VII.

Receipts and expenditure of the Department of Agriculture for the year ending on the 30th June 1911.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
Sale of manure and Farm produce.	10,711	*Experimental cultivation.*	
Other receipts ...	4,330	Superintendence ...	84,038 14 9
Total receipts ...	15,041	*Expert staff.*	
		Fibre Expert ...	19,693 14 2
		Agricultural Chemist ...	12,650 6 2
		Economic Botanist ...	16,090 14 0
			1,32,474 1 1
		Experimental Farms.	
		Dacca Farm ...	59,623 7 9
		Burirhat Farm (Rangpur)	12,835 5 0
		Rajshahi Farm ...	8,299 7 4
		Jorhat Farm ...	11,198 8 6
		Upper Shillong Farm and Fruit Experimental Station.	15,671 15 0
		Wahjain Tropical plantation (Theria).	1,793 2 0
		Central Seed Depôt ...	7,159 7 8
		Total Experimental Farms	1,16,581 6 3
		Agricultural Demonstrations and Experiments.	
		Establishment for the revival of silk industry in Rajshahi.	9,169 11 9
		Sericultural School, Rajshahi.	3,786 0 5
		Sericultural Experiment at Shillong.	72 0 0
		Other Agricultural Demonstrations and experiments.	
		Other demonstrations ...	3,587 1 9
		Terraced rice cultivation in Naga Hills.	400 0 0
		Grant to Agricultural Association, Rangpur.	3,000 0 0
		Total Agricultural demonstrations and experiments.	20,014 13 11

APPENDIX VII—*concld.*

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
		Public exhibitions and fairs.	
		Agricultural and Horticultural Exhibitions, other fairs and shows.	2,485 8 0
		Registration of river-borne traffic.	9,770 11 3
		Registration of railway traffic.	1,890 0 0
			14146 3 3
		Provincial Statistics.	
		Frontier road-borne traffic	897 7 3
		Internal road-borne traffic	720 0 0
		Rain gauge establishments	224 15 6
			1,842 6 9
		Total Expenditure ...	2,85,058 15 8

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE YEAR ENDING

30th June 1912.

SHILLONG:

PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1912.

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AGRICULTURAL DEPARTMENT.

AGRICULTURE BRANCH.

No. 2449 IIP-I.

FROM

J. McSWINEY, Esq., M.A., I.C.S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE,
ASSAM,

To

THE SECOND SECRETARY TO THE CHIEF
COMMISSIONER OF ASSAM.

Shillong, the 28th September 1912.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1912.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

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REPORT

OF

THE AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE YEAR ENDING

THE 30TH JUNE 1912.

CHAPTER I.

ADMINISTRATION.

1. This report deals with the Department of Agriculture in Assam only, in accordance with the orders contained in the Eastern Bengal and Assam Government Order No. 922-85, dated the 27th March 1912.

2. The post of the Director of Agriculture, Eastern Bengal and Assam, was held by Mr. S. G. Hart up to the 31st March 1912, and with the reformation of the province of Assam, I assumed charge of the Agricultural Department combined with the Department of Land Records from the 1st April 1912. During the year Mr. Hart spent 20 days in Assam and 12 days on tour. The chief objects of the tours were—(i) inspection of agricultural stations and demonstrations, (ii) collection of information in regard to agricultural and economic conditions, and (iii) most important of all, keeping the Department in touch with local officers and non-officials who are interested in agricultural development.

Director.

3. Mr. A. G. Birt, B.Sc., held charge of the Jorhat Farm throughout the year. Till April 1st 1912 his headquarters were at Dacca and he held charge of the Dacca, Burirhat and Rajshahi farms in Eastern Bengal in addition to the Jorhat Farm in Assam. From April 1st he was transferred to Assam as Deputy Director with headquarters at Shillong. He actually took over charge in Shillong on April 15th, having been deputed, at the request of the Bengal Government, to hand over charge of the farms at Dacca, Burirhat and Rajshahi personally to the Deputy Director of Agriculture, Bengal. He was on tour for 137 days up to March 31st and for 55 days from then until June 30th, making a total of 192 days for the year under report. He inspected the Jorhat Farm eight times and spent a few days there on each occasion. In November 1911 he attended the meeting of the Board of Agriculture at Pusa as a representative of Eastern Bengal and Assam, and again visited Pusa in April to consult the Agricultural Adviser to the Government of India about sugarcane growing in Assam. In February he accompanied the Agricultural Adviser to the Government of India on a tour in Assam.

Deputy Director.

Mr. J. N. Chakravarty, B.A., M.S.A., held charge of the office of the Deputy Director of Agriculture, Shillong, from the commencement of the year until April 15th, when he was relieved by Mr. Birt and reverted to his former appointment in Eastern Bengal.

4. There is no Fibre Expert in this Province. Mr. R. S. Finlow, B.SC., Fibre Expert, Bengal, worked in part for Assam also. Experiments with flax cultivation were conducted under his advice at the farm of Mr. H. J. Lawrie of Baihata in Kamrup. An extract from his report on these experiments is given below :—

Fibre expert.

"*Flax experiment in Assam.*—During the season 1911-12 two acres of flax were grown at Baihata, Kamrup. Although the seed was not sown in the proper way, the crop was an excellent one over the greater portion of the area and there is now no room for doubt that good flax can be grown in Assam. Unfortunately there are no reliable figures for the weight of the produce, but it is hoped that results may be available in the coming season to shew how the Assam grown plant compares with that produced in Behar as regards (*a*) quality of fibre, (*b*) percentage of fibre in the plant. It is possible that the Assam product may be superior to Behar grown flax in the latter respect. The fibre produced at Dooriah has been excellent in quality, but the percentage of fibre in the plant has hitherto only been about 10 per cent., whereas in Europe 15 per cent. of fibre is common. This of course seriously reduces the yield of fibre.

Other fibres.—During the last 10 years a large acreage of Sisal Hemp and other Agaves has been planted in different parts of India, especially in Assam; but in no instance has the venture been so successful as might have been anticipated from experience with the same crop in other countries. This has been due chiefly to the fact that the plant "poles" or flowers so much sooner in India than it appears to do in Mexico and in the West Indies. As the plant dies after flowering the obvious result of premature poleing is to very largely reduce the efficiency of a plantation and there is little doubt that this is the chief reason for the abandonment of so many Sisal plantations in India. So far as is known, Sisal Hemp is much the best plant to use in every other respect excepting the time of poleing, but the objection to it on the score is so serious that, unless some means of controlling the time of poleing is discovered, it is likely that the Agave planting industry in India will become extinct. The Economic Botanist in the United Provinces has undertaken a series of experiments with the object of discovering the factors which influence the flowering time of Sisal, and a set of experiments on other lines has now been laid down at Dacca. The object of the latter is to compare as many as possible kinds of Agave with Sisal as regards all the factors which determine the value of such a plant as a fibre producer.

These are :—

(*a*) Weight of leaf produced per acre.

(*b*) Percentage of fibre in the leaf.

(*c*) Time of flowering.

It is just possible that there may be some variety which, while not so good as Sisal in respect of factors (*a*) and (*b*), might have an overwhelming advantage in regard to the time of flowering. Time alone of course can decide the question."

5. Mr. A. A. Meggitt, B.SC., Agricultural Chemist, Bengal, worked in Assam throughout the year in addition to his work in Eastern Bengal. He was on tour for 167 days, visiting Jorhat 5 times in connection with the sugarcane and other experimental work which is being carried out by him in collaboration with Mr. Birt. He accompanied the Agricultural Adviser to the Government of India for part of his tour in Assam in February and visited Shillong in May last at the wish of the Chief Commissioner to attend the Conference convened to deal with proposed sugar cultivation experiments in Assam. A full report of his work is given in Appendix I.

Agricultural chemist.

6. There is no appointment of Economic Botanist for Assam, but the services of Mr. G. P. Hector, M.A., B.SC., Economic Botanist, Bengal, are available when required.

Economic Botanist.

7. Srijut Bina Ram Das was Superintendent throughout the year. M. Fazlal Haq Ahmed, a graduate of the Poona Agricultural College, was transferred to Jorhat from Dacca in November 1911. He is under training for the post of District Agricultural Officer and is at present in charge of demonstration work in the Jorhat Subdivision.

Jorhat Agricultural Station.

About 20 acres of high land adjacent to the farm has recently been acquired for extension of experiments. It is proposed to lay out and bring this new land under cultivation during the ensuing year.

Upper Shillong Agricultural Station.

8. During the year, about 30 acres of pine forest were cleared and brought under cultivation. An attempt was made to bring under cultivation a portion of the marshy land in the valley, but this was only partially successful on account of the peaty nature of the soil.

Mr. Herrick Singh, the Farm Superintendent, was in charge of the farm except for three months when he was on privilege leave. During this period his duties were taken over by Babu Mohini Mohan Ghose, Farm Overseer, Dacca.

Since April Babu Rukmini Mohan De, a graduate of the Nagpur Agricultural College, has been employed as fieldman clerk. He was transferred from the Burirhat Farm, Eastern Bengal, where he held a similar position. From next year it is proposed to employ him in the Surma Valley.

Fruit Station.

9. Definite orders for the abandonment of this station have recently been received. It is proposed to hand over the site to the Roman Catholic Mission as a training ground in Sericulture and gardening for their orphan boys, but final arrangements have not yet been made.

Arrangements have been made with Mr. C. H. Holder of Shillong, who has already successfully grown several varieties of fruit in his own garden, to make experiments with fruit on a new and more suitable site.

Wahjain Tropical plantation.

10. This station was abandoned during the year. It has been handed over to U Bordhan Roy Kanti at the nominal rent of Rs. 10 per annum. Certain conditions have been imposed in the lease with regard to the treatment of the plants which were under experiment.

Expenditure and receipts.

11. Figures showing the total expenditure incurred by the Department of Agriculture during the year ending the 30th June 1912 are not available separately for Assam. The expenditure on the Experimental Farms, etc., in this Province amounted to Rs. 25,490-13-3 and the receipts to Rs. 5,926-1-3 as shown in Appendix III.

CHAPTER II.

AGRICULTURAL EDUCATION.

The following note by the Director of Public Instruction is reproduced :—

"The connection of the Education Department with Agriculture is indirect. The only innovation of importance during the year has been the introduction of a new course of vernacular studies which differentiates between urban and rural schools and aims at providing for the pupils of each an education suited to their needs. In particular, stress is laid in the curriculum for village schools upon practical work in the school garden with a view to early training in the operations of agriculture. It is hoped that under the new curriculum the village boy will be taught to use his powers of observation, to think for himself, and to follow his hereditary calling more intelligently and without discontent. The main difficulties lie in the ignorance and conservatism of the teachers and the unwillingness of parents to allow their children to remain at school until they have completed even the Lower Primary course or received instruction sufficiently advanced to make its effect of permanent or continuing value."

Nature study in Primary Schools.

Messrs. Basu and Majid's Lower Primary Readers contain valuable lessons on, nature study and agriculture.

Apprentices on Government Farms.

13. Two Khasi apprentices are under training for the post of fieldman demonstrator at the Upper Shillong Farm. Two Lushai youths sent by the Superintendent, Lushai Hills, are being instructed in potato growing, feeding and care of cattle, and use of implements, etc., at Upper Shillong. On completion of their training it is proposed to employ them as demonstrators of agricultural improvements in the Lushai Hills.

Special Short Courses.

14. A Gurkha mali was trained at Dacca under the Arboricultural Expert, Eastern Bengal and Assam, for a little over five months in methods of fruit culture suited for this Province, and sent to Tissama in the Naga Hills where a fruit garden was started under the Deputy Commissioner. The mali received at Shillong a further short training in cold-weather work, grafting and pruning.

Poona College.

15. Srijut Nareswar Das, the last of the Government scholars of this Province sent to the Poona Agricultural College by the Eastern Bengal and Assam Government, completed his course in April 1912, and obtained the diploma in Agriculture of that College.

16. At present no student from Assam is undergoing training in the Agricultural College at Sabour, in the province of Bihar and Orissa. This is the College where, according to the decision of the Government of Eastern Bengal and Assam, students from this Province should receive agricultural training: the number of annual admissions allotted to Assam has not yet been decided. Three candidates have applied for admission, but they each want a scholarship. The question of the grant of scholarships was under the consideration of the Government of Eastern Bengal and Assam, and has now been taken up for Assam. No decision has yet been arrived at in the matter.

Sabour College.

17. Babu Binod Bihari Das, who obtained the degree of B. Ag. of the Bombay University from the Poona College in April 1910, underwent the second year of his post-graduate training at the Dacca Farm. He has lately been transferred to the Shillong Farm for a further course of one year's post-graduate training under the Deputy Director of Agriculture.

Post-graduate training.

Maulvi Fazlul Haq Ahmed obtained the diploma in agriculture of the Poona College in April 1911, and was attached to the Jorhat Farm for the first year of his post-graduate training under the Deputy Director, under whom he will complete the remaining period of his training.

CHAPTER III.

Experiment and Research.

18. The work mentioned in last year's report as having been commenced at Jorhat was continued and extended by the Agricultural Chemist and the Deputy Director of Agriculture. Some most interesting field results have been obtained, showing that without the addition of lime *rabi* crops will not grow at all on this soil, even when manured with cowdung and phosphate in the form of bonemeal. Laboratory work, which is being done by the Agricultural Chemist in connection with these field experiments, has demonstrated the existence in this soil of an organic compound poisonous to plants, but which can be neutralized and rendered harmless by the addition of a suitable quantity of lime.

High-land soil investigations.

A full account of this work up to date is given in the Report of the Jorhat Agricultural Station for the year ending June 30th 1912.

19. Experiments with sugarcane were continued at Jorhat. The chief feature of the year's work was the remarkably good results obtained from three of the Barbadoes varieties, *viz.*, B. 376, B. 147 and B. 208. These varieties have improved enormously during the last two or three years and especially since they have been grown on land which has been limed. This year B. 376 ratoon gave 3·8 tons of total sugar per acre and 3·7 tons of cane sugar. Full particulars of the experiments are given in the current report of the Jorhat Farm. It is proposed shortly to publish an account of all the work on sugarcane done up to date at Jorhat.

Sugarcane.

20. The experiments at Upper Shillong were continued. In the variety trials King of Potatoes and Magnum Bonum (farm grown seed) have again given the best results. New seed of Magnum Bonum procured from England was found to be less immune to disease than the farm grown stock. Winter grown seed proved to be immensely superior to summer grown seed and whole sets to cut sets, while another experiment demonstrated the advantage of propagation of potatoes twice a year. In a planting experiment to compare the local method with the ordinary English method the result was practically identical, shewing that one method is as good as the other.

Potatoes.

On the whole the yields of potatoes obtained at Upper Shillong this year were good, the season having been more than usually favourable.

21. These on the whole appear to have done somewhat better this year than hitherto. The following varieties of peaches, *viz.*, Dr. Hogg, Early Rivers, and Nobbles, bore well and ripened some very fair fruits. Of the apples, Kerry pippin, King of Pippins and Allington pippin bore fruit which was of good size and quality. Some excellent English raspberry fruits were obtained for the first time this year. A few May Duke cherries set and ripened on the tree. Nectarines and apricots fruited well, but most of the apricots dropped off before ripening and the nectarines split on the trees. The pinching off of shoots during summer to induce the maturation of fruit-bearing spurs was continued.

Fruit trees.

Green Manure crops.

22. At Jorhat all the land is regularly green manured with cowpeas once in a four years rotation, and this practice has proved very successful. At Upper Shillong a considerable area was green-manured with soy-beans. Local *matirkalai* has also been tried, but does not make such good growth as soy-beans.

Fodder Crops.

23. Seed of alsike clover, lupins and Italian ryegrass was obtained from England and sown at Upper Shillong. Ryegrass and alsike were sown mixed, but the alsike died out soon after germination ; the ryegrass has grown fairly well, but seems likely to be ousted eventually by the rapid growth of indigenous grasses. Lupins are decidedly promising and seed is being saved for sowing next year. The following local crops are proving to be the best fodder producers at Upper Shillong—Maize, Khasi Soy-beans, Job's tears, Langtylli grass and sweet Potatoes. Jerusalem Artichokes were also tried, but failed to germinate.

CHAPTER IV.

DISSEMINATION.

Section I.—Demonstration.

Rice.

24. Demonstrations and the manuring of winter rice with bonemeal were carried out in 9 villages in the Khasi Hills. The results as in previous years were highly satisfactory. The practice of using bonemeal as a manure for paddy is rapidly spreading in the Khasi Hills: this year 127 maunds were sold by the Department to cultivators for this purpose. The only obstacle in the way of further progress in this direction is the high price (*viz.*, nearly Rs. 5 per maund) of bonemeal which has to be brought from Calcutta. If the price could be brought down to from Rs. 2 to Rs. 3 there is no doubt but that most of the paddy land in hills would be manured. With the object of obtaining a cheaper supply we have under consideration the installation of a bone grinding plant at Shillong, but before coming to a decision, it is necessary to make sure that there is a sufficient annual supply of bones in the hills to justify the expenditure on the grinding plant. Enquiries are now in progress with the object of ascertaining the amount of bones annually available.

The cultivation of wet rice continued to progress in the Naga and Lushai Hills.

The Deputy Commissioner, Naga Hills says :—

" Wet rice cultivation is the mainstay of the Angamis, and is maintained by an elaborate irrigation system. A few fields worked on the same system are to be found among the Kacha Nagas and Rengmas. Other tribes had a few wet fields, but the rice was sown broadcast *in situ* instead of being transplanted as among the Angamis, and there was no irrigation. Very little has been done to extend the system except among the Aos and Semas of the Mokokchang subdivision. At Mokokchang itself irrigation appears to have taken a fair hold and the area under wet rice cultivation is extending yearly. So also at the big village of Ungma close by and at Changki. Along the Sema road are several water fields owned by Sema Gaonburas who have received pecuniary aid or encouragement from Government, and new fields were made at Sakhalus, Emilomi and Vekohomi; but among the Semas it seems that the advantages of irrigation are not recognised yet. * * * * I should like to send out some Angamis next year for four or five months to help in cultivating new fields."

The following is extracted from the report submitted by ths Superintendent, Lushai Hills :—

" The land under wet rice cultivation at Champhai and Vanlaiphai Valleys produced good crops this year and no damage was done by rats, a fact which adds to the arguments in favour of this style of cultivation. The small valleys suitable for wet cultivation taken up last year were demarcated ** and definitely allotted to cultivators who prepared the ground. More flat land suitable for this style of cultivation has been found. Lushais are now appreciating the benefit of wet rice cultivation and joining the hamlets established at these places. Not less than 400 houses with a population of about 2,000 persons are now cultivating by this method. Several houses in the north of the district have adopted this method."

Sugarcane.

25. Srijut Debeswar Gossain, an Associate of this Department, carried out demonstrations of the Striped Mauritius and B. 147 in his farm at Barpathar in Golaghat Subdivision. He procured from the Jorhat Farm 800 cuttings of the former which were planted on an area of 2 kathas or nearly $\frac{2}{15}$ of an acre, which was harvested in April 1912, yielding 89 maunds 28 seers of dressed cane. From this, 59 maunds 39 seers of juice was obtained. The final product amounted to 4 maunds 25 seers of sugar and $3\frac{1}{2}$ maunds of *rab*, valued at Rs. 55-2-0 in all.

Potatoes.

26. The spraying of potatoes with Bordeaux Mixture as a preventive of disease was demonstrated in 8 villages in the Khasi Hills in 1912. In each case an adjoining plot was left untreated as a check. In every case the sprayed plot gave an increased yield over the untreated plot, varying from 7 maunds per acre to 27 maunds per acre, the average increase being about 12 maunds.

In Jorhat Subdivision 12 demonstrations were made with the object of introducing the cultivation of potatoes to the local ryots. The results were not so satisfactory as was expected. Disease and the attacks of red ants seriously damaged the crop and the yield was low, varying from only 27½ maunds per acre in one case to 76 maunds per acre in another. The crop on the whole was not a profitable one on account of the low yields, although the plot which yielded 76 maunds per acre showed a profit of Rs. 78 per acre. The results further indicate that where the yield was 50 maunds per acre or more the crop was grown at a profit, but under 50 maunds per acre it was at a loss.

U Kubur, an Associate and Honorary Correspondent of this Department, demonstrated the advantage obtained in using winter grown potato as sets over the summer seed on land of equal fertility, as far as can be judged by sight and with equal treatment in cultivation and use of manure in all cases. The use of winter seed resulted in an outturn of 20 times the seed used, while the summer seed produced in one case only 3⅓ times and in another 6 times the amount of seed used.

Fruit.

27. Two fieldmen demonstrators were engaged in grafting fruit trees in the Khasi Hills and instructing orchard owners in the art of grafting. Numerous villages were visited and 410 trees were grafted by the demonstrators, of which 253 were pears, 47 apples and 110 apricots.

In the Lushai Hills the introduction of fruit trees was progressing satisfactorily. A large number of orange plants and pineapple suckers were again distributed to those villages which take an interest in fruit. A number of grafts of various kinds of fruits such as lichi, plum, peach, sapota, etc., were obtained by the Superintendent and planted at Sairang for propagation.

In the Naga Hills the fruit garden at Tissama was started from the 1st March 1912, when the Gurkha mali trained at Dacca and Shillong arrived. He took with him a number of plants of various fruits for planting, most of which, especially the orange and pineapple, are reported to be thriving.

Cotton.

28. Buri or bhuri cotton was grown by Mr. Lawrie on land belonging to the Rangia Estates, Ld., at Hossang in Kamrup district. The seed was obtained from the Agricultural Department, Eastern Bengal and Assam, and was sown towards the end of June and some in July 1911, that is, sometimes after the rains had broken. The land was prepared by rough hoeing and ploughing and the seed was put in 3 feet apart. There were about75 acres put out amongst young rubber and 25 acres were exclusively under cotton. The Imperial Cotton Specialist visited the estate in January 1912 and found that the cotton plants were well grown and were laden with bolls which were free of any disease or pest and were bursting freely when ripe. The cotton was of excellent quality quite equal to the best bhuri, and by attending to early sowingin April, and a thorough cultivation of the ground and by strict attention to weeding, especially during the early period of growth, he considered that there was every prospect of the successful introduction there of buri cultivation on a large scale. He advised that the introduction of Egyptian and other foreign varieties, whether they did well or badly, should not be attempted, as the ultimate result would most certainly be a mixture of types which would give an uneven cotton. He further advised that perennial cottons should not be tried and that bhuri plants should not be carried on from one season to another but a fresh start should be made each year: further, a rotation, preferably with mustard, should be adopted to ensure the maintenance of the land in good order. The outturn obtained was very small, and although this was due mainly to late sowing and want of weeding and cultivation, it is not advisable for other people to follow this example until a more satisfactory outturn has been obtained.

Section II.—Aid to the Public.

Aid in combating insect pests.

29. This Department at present has no Entomological Collector whose aid can be lent to combat insect pests on crops in the province. The Entomological Collector, Bengal, was able to visit some places in this Province from which requests for aid were received. He spent altogether 18 days only in Assam. He visited Baniyachang, at the request of Babu

Girija Nath Biswas, Honorary Correspondent, in Connection with an outbreak of rice stem-borer; although the outbreak had subsided before he reached the place, he was able to give instructions how light traps should be used in similar outbreaks in future. He visited Shillong and completed the investigation of the rice pest "Paintaphih"; its life history and possible remedial measures were explained to the Honorary Correspondent, U Kubur Singh and others of Mylliem in the Khasi Hills.

Sanction has been received since the close of the year to the deputation of an agricultural graduate of the Province to the Agricultural Research Institute at Pusa, with a monthly allowance of Rs. 30, to undergo a course of training in entomology for one year.

Aid in combating fungus diseases.

30. The Mycological Collector, Bengal, was on tour in Assam for 45 days and visited Shillong, Goalpara, Sylhet and Cachar in connection with outbreaks of fungus pests on various crops, chiefly potato, sugarcane, tomato and betel-nuts. The fungi concerned in each case were identified and advice given by him to cultivators as to the best methods of combating them. The most important disease under investigation was the betel-nut disease which has been doing very considerable damage chiefly in Sylhet, Cachar and Goalpara. The most severe outbreak of the disease was noticed at Kanairghat in the Jaintia Parganas, in Pargana Chapghat in Karimganj subdivision, Sylhet, and in Baithamari Dehi in Goalpara. It was estimated that the average loss was about Rs. 25 per bigha over a considerable area in Sylhet, where this most destructive disease first made its apperance after the earthquake of 1897. The Imperial Mycologist visited Sylhet in 1905 and investigated the disease. A note on the subject was published by him under the title "Betel-nut Plague in Sylhet" in the Agricultural Journal of India, Volume I, Part 4, October 1906, in which certain remedial measures have been suggested. Since the close of the year further communication regarding the disease in Goalpara were received from him.

Seed supply.

31. The Central Seed Depot maintained by the Bengal Agricultural Department at Dacca continued to supply good seeds, manures and implements to officers and others, associates and correspondents of this Department in Assam. One hundred and twenty-five maunds of seed potatoes were supplied from the depot to applicants in Assam and about 500 maunds were sold from Upper Shillong Station to Khasi cultivators in 1912: over 16,000 cuttings of sugarcane were supplied, almost all to the Baikunthapur Garden in Sylhet; other seeds including cereals and pulses, jute and sunn hemp, etc., issued from the depot amounted to a little over 25 maunds.

Bonemeal to the extent of 135 maunds was distributed from the depot in addition to 127 maunds distributed from the Shillong Station to Khasi cultivators. Over 5,000 orange seedlings were supplied from the Khasi Hills for cultivation in Sylhet.

Besides these, 30 maunds of seed potatoes, 3 maunds of cow pea, 2 maunds of jute seed and 5 seers each of dhaincha and sunn hemp were supplied free to Associates and correspondents of this Department, half price being realised for 3 maunds of potatoes only.

Section III.—Operations for the improvement of livestock.

Cattle breeding.

32. The breeding of Patna bulls for distribution with the object of improving the local breed of cattle was continued at Upper Shillong. During the year five young bulls were sold to Khasi cultivators. It has been decided to stop the practice of lending out bulls free on account of the abuse of this privilege in the past; the people who have borrowed the cattle hitherto have taken no trouble to see that they were properly treated and consequently the bulls got entirely out of condition and had to be brought back to the farm.

Sheep breeding.

33. The flock at Upper Shillong at the end of the year numbered 136. There was an unusual amount of mortality during the year, chiefly owing to an outbreak of foot-and-mouth disease.

A report on some samples of wool sent to Liverpool for valuation was recently received. It is interesting to note that the wool of the cross-bred is valued at a very much higher rate than that of the Khasi sheep and also appreciably higher than that of the Dumba. The actual valuations were:—

Cross-bred	6½*d.* per lb.
Dumba	5¾*d.* „ lb.
Khasi	2½*d.* „ lb.

Poultry operations.

34. Poultry operations conducted under the Superintendent, Lushai Hills, continued to progress, although owing to the scarcity of food the distribution of fowls and eggs from the poultry farm at Aijal was not so extensive as in the previous year. During the year 4,832 eggs were sold to Lushais at two annas each, and about 80 fowls: the total sale proceeds amounted to Rs. 798-1-0. The total number of imported birds in the district is about 9,800, and the number of cross-bred birds 19,000. There are 5 different kinds of fowls, *viz.*, (1) Australian Buff-Orpington, (2) China-Langshan, (3) Wyandotte, (4) White-Orpington and (5) Chittagong. Mr. Henniker reports that much good has been done by the operations in improving the breed of fowls in the district and in fostering in the Lushais an aptitude for poultry farming.

The Deputy Commissioner, Khasi and Jaintia Hills, procured a batch of 130 fowls of the Chittagong and Langshan breeds from the Superintendent, Lushai Hills. Of these a few died on the way or were lost, and 123 were sold to various Khasi owners. Mr. Allen says that the fowls have thriven and done well and are very well spoken of, although in certain localities inter-breeding has occurred with other cocks in the village.

Section IV.—Sericulture.

Sericulture.

35. This year the sericulture operations formerly carried on at the Fruit Farm were transferred to the premises of the Roman Catholic Mission, Shillong. The rearing was carried out by the orphan boys under the instruction of the trained demonstrator of this Department, which supplied also mulberry leaves and appliances for rearing. The demonstration proved successful, an outturn of 3 maunds 3 seers of green cocoons being obtained from 2¾oz. of seed.

Section V.—Agricultural Shows and Exhibitions.

Shillong Show.

36. A show of Flowers, Fruit, Field and Garden Produce, Cattle, etc., was held on May 24, 1912. A separate report on the Show has been submitted. It has been decided by the Chief Commissioner that from next year there will be two shows at Shillong, *viz.*, (1) a Flower Show and (2) a Vegetable and Field-produce Show: the former will be held in the month of April in the grounds of the Government House, where only flowers will be exhibited and the latter by the month of September and will be managed by the Agricultural Department.

Section VI.—Agricultural Associations and Associates.

Associates.

37. At the end of the year, out of 20 Honorary Correspondents 3 also held the post of Associate of the Department of Agriculture; all of them are expected to carry out at least one demonstration every year of an improvement recommended by the Department. Owing to want of staff, the work of the Associates cannot be supervised efficiently and the number of Associates cannot therefore be increased at present. The appointment of two District Agricultural Officers in June next, when the Poona graduates complete their training, will help in developing and co-ordinating the efforts of the Associates and keep them in touch with the new developments of our experimental work.

There were no agricultural associations.

CHAPTER V.

Publications and Supply of Information.

Statistical publications.

38. Crop forecasts, weekly and annual season and crop reports, and annual report on tea cultivation, the annual report on rail and river-borne trade, the returns of trade, rainfall, prices and all agricultural statistics are published periodically by this Department. A report on the Census of wages taken in August 1911 was published by the Director of Agriculture, Eastern Bengal and Assam, and a memo on the average yield per acre of the principal crops in Assam based on experiments made up to 1911-12 was published by me during the year.

Agricultural publications.

39. *Farm Reports.*—A report on the work of each Agricultural Station is published annually in autumn.

Bulletins.—A note on manures available in Eastern Bengal and Assam and the experience acquired in their use was drawn up by the Agricultural Chemist of that Province, originally for submission to the Board of Agriculture held at Pusa in November 1911. It has recently been published as bulletin No. 23 of this Department. No other new bulletin was issued during the year, but the bulletins on Rhubarb and Asparagus were revised by the Arboricultural Expert, Eastern Bengal and Assam.

Honorary Correspondents.

40. At the end of the year there were 20 Honorary Correspondents of the Department as shown in Appendix II. They send periodical reports on the state of the crops, which afford a useful check on official estimates contained in crop forecasts. They also supply useful information in regard to the outbreaks of cattle disease and of blights and insect pests. Most of the correspondents, a few of whom are Associates as well, carry out some demonstrations of improvements which the Department desires to introduce. In return for the information supplied or demonstration conducted, they receive all publications relating to agricultural improvements issued by the Department and are assisted with free gifts of seeds and manures ordinarily to the value of Rs. 50 and free use of implements or machine required for such demonstration; but seeds, manures or implements required for experiment on their own account are supplied at half cost, the total cost to the Department during any year not exceeding Rs. 25 for each such correspondent or associate.

U Kubur Singh of Mylliem, an Honorary Correspondent of the Department, was awarded a Coronation Durbar Medal for public spirited efforts to introduce improved agricultural methods in the Khasi Hills.

CHAPTER VI.

MISCELLANEOUS.

Handloom weaving.

41. After the close of the year, the services of Mr. Narayan Pillay, Weaving Instructor, Bengal, have been placed at the disposal of this Administration for two months with the sanction of the Government of Bengal, for rendering advice and instruction to the Mech community of Goalpara, in improving their looms or their methods of weaving and warping. He will demonstrate to them the working of the Salvation Army loom and, after teaching them other improvements in weaving, proceed to Panchakhanda in the Karimganj Subdivision, Sylhet, where the local weavers have asked for his advice.

Serampur Weaving Institute.

42. Hitherto the Weaving Institute at Serampur has been of very little advantage to the Province, no student having come forward to receive training there. The question of granting a few scholarships to youths desirous of joining the Institute is under consideration.

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

Shillong,

The 28th September 1912.

APPENDIX I.

Report of the Agricultural Chemist to the Government of Bengal, for the year ending 30th June 1912, including the work done by him in Assam.

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4. *Sugar work.*—This work again took almost my whole time and attention for some 3 months during the year. It included the harvesting and analysis of all the experimental cane plots. Ratoon and Plant, in connection with the scheme of variety work being carried out at Jorhat. It will serve no useful purpose to present a mass of figures here; the full results will be found in the current report of the Jorhat Farm. Some of the exotic varieties introduced from the Barbadoes and elsewhere are now fairly well acclimatised, and showing most excellent promise, giving yields up to and just over 30 tons of cane per acre with only moderate manuring, and yielding a juice very rich in cane sugar and remarkably free from other solid matter *i.e.*, of exceedingly high purity (over 90 per cent.). Such canes are admirably suited to Central Factory Work; the one point above all others which emerged from the discussion before the recent Board of Agriculture on sugarcane, was the prime necessity for the introduction of higher-class canes into cultivation in this country. We claim to have done this at Jorhat.

Up to date we have been solely engaged in introducing new varieties into Assam and neither time nor space has been available for manurial experiments. This work will now shortly be taken up and it is not too much to say that we think it should in Assam prove easily and economically possible to produce crops of 40 and over tons per acre of first class cane.

Variety work can never be dispensed with on account of the possibility of the sudden deterioration or possible total extinction of a given cane through disease, say. The instance quoted by Dr. Barber of a whole planting district in the West Indies, having been saved by having at hand the product of a "Sport" carefully propagated and distributed by a planter, when the variety then in cultivation suddenly went out by disease, is sufficient to show the danger of giving up variety work.

There must always be facilities for testing promptly any variety of cane that has elsewhere shown exceptional qualities. While, therefore, variety work has been continued during the past year, recognising that the time had arrived for a broadening of the basis of our cane work, we have taken up more land, and a commencement has during the year been made upon a forward policy of expansion and development along different lines, having for its object the economical production of increased yields of first class canes, which includes the possibility of a reduction of productive charges so far as can be effected by the substitution of cultivation by implements for manual labour, where it can be effected.

The work involves questions of :— (*a*) cultivation and drainage, (*b*) time and methods of planting, including distance between rows and disposition of sets within them, (*c*) manuring, (*d*) methods for combating borer and disease, selection of planting material, etc.

Preliminary work along the several lines set out was commenced during the year.

Special cultivation having for its end the amelioration of bad subsoil conditions was given.

A superior drainage scheme was laid down, one which has proved itself capable of quickly removing surface water and of reducing the soil water level to a depth of 3 feet or so within 24 hours after the cessation of heavy and continuous rain.

Experiments on time and methods of planting, the latter with reference to the possibility of introducing implements for inter-cultivation, were initiated.

A change was made in our manurial policy with the object of reducing losses by leaching to a minimum, and thus getting the best value out of it for the cane.

In view of a recrudescence in disease in one or two varieties and in the hope of improving the general vigour and stand of cane, each variety was submitted to a much more rigorous selection for planting material than has hitherto been necessary, each variety being selected on its merits. In selecting, three points were given special prominence, *viz.*, (i) freedom from disease, (ii) tillering power, (iii) general vigour.

In one case one feature would assume special importance, in another it would be subordinated to some other of greater importance. Each variety was thus submitted to a preliminary but more or less drastic selection in the field, followed by a further selection after removal of the chosen clumps and their division into sets for planting.

In all some 25,000 sets were thus prepared and each individual carefully examined, and the beneficial result of this work is already in evidence in the diminished incidence of disease, in the plots and the improved tillering and vigour.

In the case of those plots which suffered from disease attacks, with the object of leaving nothing above ground which might perpetuate the disease, after harvesting the plant cane, the dried leaves, etc., were spread thickly over the whole area and burnt. The immediate result was a very much improved tillering in the plots so treated. The work set out above and other details which space forbids my going into demanded my constant personal supervision for a total period of some 3 to 4 months.

Ordinary routine work is apt to be illdone at times, while in the case of new lines of work the risk is very much increased in the absence of constant supervision.

5. *Soil work.*—In connection with the permanent manurial and rotation experiments laid down on the old alluviums at Dacca* and Jorhat in 1910-11 and in the relation to the very positive and valuable results which are even now being obtained, I undertook during the year a good deal of soil work involving :— (*a*) Soil acidity tests, (*b*) Soil moisture work, (*c*) Preliminary Nitrification Studies, (*d*) Search for specific plant toxins (*e*) Crop analyses.

* See report of Dacca Farm for year ending 30th June 1911. Also the Annual Report of Agricultural Chemist, Eastern Bengal and Assam, for the year ending 30th June 1911, and programme of work of the Agricultural Chemist for 1912-13. (Incorporated in Annual Report of Agricultural Department, Eastern Bengal and Assam, year ending 30th June 1911.)

(*a*) and (*d*) were made on both Jorhat and Dacca soils, (*b*), (*c*) and (*e*) only in connection with Dacca Experiments.

(*a*) Acidity tests were made to determine what was the immediate neutralising effect of varying applications of lime, and to what depth in the soil such dressings had penetrated, and to see how far this was correlated with observed differences in cropping.

It may be remarked here that according to my tests the surface soil at Dacca is less acid than the sub-soil, while at Jorhat the more acid soil is on the surface. One would naturally suppose then that the immediate effect of applications of lime to the surface would be greater at Jorhat than at Dacca, and this is certainly strongly seen in practice, with lapse of time, and as the lime works downwards, this disparity in effect will probably disappear. The plots which received no lime and also those which received 10 maunds lime per acre, both at Dacca and Jorhat, were acid at all depths. The plots receiving 30 maunds lime per acre were faintly alkaline for the first three inches and still acid below that depth.

In the case of 60 maunds lime plots, at Dacca the first 6 inches of soil was alkaline, while from 6—9 inches was still acid ; at Jorhat only the first three inches was alkaline, the lower depths being acid.

These differences were quite well reflected generally in the crops.

(*b*) *Soil moisture work.*—Having regard to the general appearance of the upland soil of the Dacca Farm during the cold weather, and that crops appear to suffer badly from lack of soil moisture during the *rabi* season, some preliminary determinations of soil moisture at varying depths were made at several places on the Farm. I may remark here that the soil takes on such a character at this season that it was with the greatest difficulty that I was able to take successive samples down to a depth of 3 feet, and to go deeper was almost impossible.

The results are very interesting and generally speaking go to show that the first foot of soil is very seriously deficient in soil moisture during the rabi season, and certainly contains no free water which can be utilised by plants.

Below the depth of a foot there is a rise in the moisture content, in some cases a steady rise down to 3 feet, in other attaining a maximum at a depth of 2 feet to 2½ feet and falling again. The maximum percentage at these depths varied in different places on the Farm from about 15 per cent. up to 22 per cent. The per centage of water in top foot of soil averages only 6·5 per cent.

There must be a slow upward passage of moisture from the lower layers, but all the results so far obtained indicate that it cannot be sufficient to provide enough moisture in the soil layers in which the roots feed to sustain proper growth, and the physical character of the sub-layers is of such a character at this season that one cannot conceive of the plants being able to send their roots sufficiently deep to obtain the water they need. It is matter of experience that crops on this soil rarely sent their roots deeper than 10 to 12 inches. It is also a fact that on this class of land cold weather crops cannot be grown successfully, and it is my intention to try to find out by further work whether the observed highly beneficial action at this season of the year of applications of certain manures may be due in part to some influence on the soil moisture content, or to the disposition of the moisture in the different soil layers.

Other physical constants have been determined during the year and they all go to swell the general evidence that the power of these soils to resist drought by retaining water for crops during dry spells of weather is very small, the constants being far below those cited for European soils of somewhat similar character.

(*c*) *Preliminary Nitrification studies.*—This work was commenced to see whether observed differences of cropping in the field could be correlated with their relative nitrifying efficiency of various areas, and to find if possible how the rate of nitrification is influenced by application of lime and phosphates, etc. Though the method used by me in the Laboratory has been used by other workers, and reported in some cases to be capable of yielding fairly trustworthy results, it seems to me now perfectly clear in view of my results and after consulting the Imperial Agricultural Bacteriologist, that it is incapable of yielding the desired information. In my hands the method did not give concordant results, and I hesitate to draw any conclusion from it at present. The method used, *i.e.*, inoculation and incubation of sterilised dilute culture solutions containing calcium carbonate as a base, so far as my results go, merely proves positively the presence of the nitrifying organisms in all soils tested by me from various parts of the Dacca Farm unmanured and differentially manured, and shows that under the suitable conditions of my Laboratory tests, they can and do multiply rapidly and bring out rapid nitrification.

While they do this, however, my tests while probably indicating that nitrification is quite active in the soils of the Farm where lime has been added, in my opinion entirely fail to show more than the mere presence of the requisite organisms in the acid and untreated areas.

That lime does not beneficially partly by reason of improved nitrification which it can cause, I am absolutely convinced, because its effect in the field is always clearly marked in the improved green colour of the cropping, both at Dacca and Jorhat.

The more or less unhealthy appearance of many crops on acid areas of the farm must at any rate partly be set down to the fact that acidity checks the work of the nitrifying and other beneficial bacteria, and the improved appearance of health following liming must be due to some extent to the removal of those unhealthy soil conditions and the increase of nitrifying efficiency.

It is highly improbable that nitrification is entirely suspended in these acid areas, yet it is possibly so far reduced that plants cannot obtain in the form of nitrates all the nitrogen which they require, hence these crops which depend for their nitrogen supplies chiefly on nitrates suffer more than an acid soil condition than others which have the power of drawing upon other combinations of nitrogen to a greater extent, and this is certainly our experience at Dacca and Jorhat.

Further experiments are required to determine whether, and to what extent, nitrification actually does proceed on the untreated soil of the Farm, and to what extent the general improvement in appearance and outturn of crops which follows the applications of lime and phosphates is due to an actual increase in the nitrifying efficiency of areas so treated.

This work is however so exacting and time absorbing that I found no further opportunity during the year of going further into it.

(*d*) *Search for specific plant toxins.*—The general deportment and appearance of many crops at various stages of their growth both on the Jorhat and Dacca Farm has also suggested to my mind the presence of specific plant poisons in these soils.

At Jorhat, the failure on untreated soils of many crops, not entirely confined to *rabi* crop ping. to survive the seedling stage has been observed during the past 6 years and remedial measures ascertained and adopted.

At Dacca, the conditions giving rise to this state of affairs are not quite so universal and uniform as at Jorhat, enormous variations in soil, as shown by the appearance of certain crops, occurring from place to place in the same area within very short distances. This gives a very patchy appearance to the crop, jowar for instance on the highland soil at Dacca making growth of anything from nothing through an inch or two upwards to 8 or 10 feet in height, and except where growth is really good the plants always have a definitely unhealthy appearance.

Samples of the Dacca soil from various parts of the farm were tested by me towards the end of the rains down to depth of 2½ feet in successive 6 inches, and all samples were found to contain unoxidised Ferrous Iron salt soluble in extremely dilute (1 in 1,600) Hydrochloric acid with only 15 minutes standing in the cold.

The samples from 6—12″ deep gave the strongest reaction. However, samples taken from this depth in the middle of the cold weather showed the presence of no Ferrous iron at all.

Extremes of climatic conditions probably account for this state of affairs, ferrous salts being always formed during the rains, when the soil is practically saturated with water for long intervals, by oxidation of organic matter at the expense of Ferric salts.

During the succeeding cold weather when the soil is dry and air can freely enter, the ferrous salts are re-oxidised.

Ferrous salts are sometimes said to be more or less poisonous to plants, but I prefer to look rather upon their presence as denoting generally unhealthy soil conditions, the *tout ensemble* being responsible for observed effect on cropping.

Further I may perhaps remark here that more recent work, not yet carried to completion has resulted in the discovery of a specific organic toxin in these soils both at Jorhat and Dacca whose effect in culture solutions under controlled condition agrees exactly with observations made in the field. This work will be published later separately.

(*e*) *Crop analyses.*—This work is being continued in connection with the permanent manurial and rotation experiments at Dacca, with the object of ascertaining how crop composition is effected by manuring. Two crops, one *Aus* Paddy and one of Mustard, were analysed grain and straw during the year, and though, the experiment is still young, very valuable and interesting results are promised. Space forbids my going into details here, but as the sort of thing one may expect I may mention that the percentage of phosphoric acid in the grain of both crops has gone up in all plots manured with bonemeal, a result which may not be entirely without significance in view of the opinions held by some as to the cause of the beri-beri disease, and also as bearing on the position which I have taken up and maintain steadily as to the great necessity for phosphatic manuring for large tracts in North-East India.

Such work also will be taken up at Jorhat in connection with a similar scheme of experiments there, when time and opportunity permit. I have found it quite impossible to deal with both experiments as fully as one could wish.

Soil improvement experiments.—The permanent manurial and rotation experiments laid down by Mr. Birt and myself in the early part of 1911, and upon which some of the various aspects of my soil work are based, are already yielding valuable and interesting results. One feels a natural reluctance to draw conclusions from a single year's cropping in connection with schemes advisedly laid down for a number of years, and in regard to which certain information can only be forthcoming, with the lapse of several years. Some of these results are, however, so clear, consistent and outstanding, and give such definite information as to the sort of treatment which our old alluvial soils need, especially for the production of cold weather crops, that an interim report of each will be published and attached as appendices to the Dacca and Jorhat reports, respectively, for the year ending 30th June 1912.

At Dacca, with *Aus* paddy and mustard as the cropping in the rains and cold weather respectively, the outstanding feature was the overwhelming effect of small applications of phosphate (as bonemeal) and lime together.

This combination costing some Rs. 15 per acre, besides giving an increase in the *Aus* paddy crop on the mustard crop alone (avefage of 4 duplicate plots) returned a net profit of Rs. 9 per acre equal to 60 per cent. on extra outlay on one crop only.

The crop was again increased by an application of cowdung, but this entailed a bigger initial outlay, and gave slightly less profit.

The use of bonemeal alone returned a moderate profit of over Rs 2 per acre, on the single mustard crop representing 24 per cent. on an extra outlay of Rs. 9 per acre.

The use of lime alone, charging its cost to the one crop, resulted in a net loss. It is the combination of lime together with phosphate which appears to be pre-eminently required on these old alluvial red acid soils.

At Jorhat, the cropping being different, *viz.*, *Aus* paddy in the rains and oats in the cold weather, the results obtained though equally striking naturally ran on rather different lines. Though fair crops of paddy can be raised without manuring, for the oats crop the great essential seem at present to be moderate applications of lime combined with organic matter either in the form of green manures or cowdung. In the absence of lime dressings no crop of oats whatever is produced, either in the presence or absence of other manuring. The advantages of green manuring are much more clearly shown on the lighter and more sandy soils at Jorhat, as also is the increased efficiency of bones when used along with green manures.

Large crops of oats were raised on some of the limed plots, the most profitable result accruing from an application of 10 maunds lime and 100 maunds cowdung per acre, on a plot previously green manured during the rains. The oats sold at Rs. 3 per maund returned a nett profit of Rs. 23-8, being at the rate of 89 per cent. on an extra outlay of Rs. 26-9 per acre.

Perhaps the most astonishing result was that from the plot receiving 30 maunds lime and 100 maunds cowdung, this plot being also green manured during the rains.

With lime costing Re. 1-11-6 per maund, the total cost of the manuring per acre was high, *viz.*, Rs. 61. It yielded a crop of over 22 maunds oats (grains) per acre and resulted in a nett profit on the single crop of over Rs. 5 per acre.

Lime at Re. 1-11-6 or even Re. 1-8 per maund is almost prohibitive, but if recently discovered deposits result in its being placed on the market at a reasonable rate there would appear to be a tremendous field for its use in Assam.

In considering the figure quoted above, it is necessary to impress the fact that the whole cost of the differential manuring has been charged against the one single *rabi* crop. In the case of the heaviest dressings of lime, which will not be repeated during the course of the experiments, and whose effect will presumably persist for a number of years, this is obviously unfair, yet in considering results to date it was thought the best thing to do. This being the case, where heavy single applications of lime have in the first instance been used, nothing but losses could be expected. Succeeding years should gradually convert these losses into profits.

6. *Green manures.*—My work on some phases of the green manuring problem was continued and extended during the year, in collaboration with Mr. Hector, to whom I am indebted for much assistance. Work on *Dhaincha* and sunn hemp was extended and certain new crops which promise to meet definite sets of conditions and requirements were brought within its scope, *e.g.*, conditions of soil, period and season of growth, power to resist water-logging, root range, facility of incorporation with the soil and subsequent rate of decay.

Chemical work included the determination of the amounts of nitrogen and organic matter contained in the various green crops raised, and in some cases these were determined for the same crop at different stages of its development.

7. *Publications.*—(1) A note on Fertilizers for the Board of Agriculture, by Mr. Birt and myself, appearing in the proceedings of the Board of Agriculture in India, Pusa, November 1911; (2) "Note on Manures," Bulletin No. 23, Assam Department of Agriculture; (3) Memoir on the "Milk of Indian Buffaloes" (In the Press).

DACCA: A. A. MEGGITT,

Agricultural Chemist to the Government of Bengal.

APPENDIX II.

List of Honorary Correspondents of the Department of Agriculture in Assam.

(The names of correspondents who are also Associates are marked *.)

SYLHET.

1. D. Fergusan, Esq., Dhamai Tea Estate, post office Dakhinbhag.
2. Babu Girija Nath Biswas, post office Baniachang.
3. „ Hara Kishore Gupta, post office Pail, Habiganj.
4. „ Satish Chandra Deb, B.L., Karimganj.
5. „ Pavitra Nath Das, post office Beani Bazar.
6. „ Amar Nath Roy, B.A., Sunamganj.
7. „ Ambika Charan Bhattacharji, post office Lanta.
8. „ Basanta Kumar Nandi, Manager, Baikunthapur Garden, post office Itakhola, Assam-Bengal Railway.

KHASI AND JAINTIA HILLS.

9. U Job Solomon, Shillong.
10. „ Kubur Sing, Mylliem.
11. „ Bordhan Ray Kanti, Mahadeo, Cherapunji.

GOALPARA.

12. Babu Dijesh Chandra Chakrabarti, Manager, Gauripore Estate.
13. „ Lalit Mohan Dutta, Dhubri.

KAMRUP.

14. Rai Saheb Chidananda Chaudhury, Gauhati.
15. *Babu Mahendra Mohan Lahiri, Gauhati.
16. Munshi Tayab Ali, Sonapur, Kamrup.

DARRANG.

17. Babu Syama Charan Maitra, Tezpur.

NOWGONG.

18. Babu Jnan Chandra Ray, Baitholungso, post office Kampur.

SIBSAGAR.

19. * Babu Akhshoy Kumar Ghose, Sibsagar.
20. *Srijut Debeswar Gossain, Barpathar, Sugarcane Farm, post office Badlipar (Golaghat).

APPENDIX III.

Receipts and expenditure of the Department of Agriculture for the year ending 30th June 1912.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
		Experimental Farms.	
	Rs. a. p.		Rs. a. p.
Sale of manure and farm produce.	3,404 12 9	Upper Shillong Farm and Fruit Garden	15,829 0 0
Other receipts ...	2,521 4 6	Jorhat Farm	5,320 10 3
Total, Receipts ...	5,926 1 3	Wahjain Tropical Plantation ...	1,092 0 0
		Total, Experimental Farms ...	22,241 10 3
		Agricultural Demonstrations and Experiments—	
		Sericulture at Shillong	75 0 0
		Other Agricultural Demonstrations—	
		Other demonstrations	874 3 3
		Terraced rice cultivation in Naga Hills	500 0 0
		Agricultural Progress in Lushai „ ...	1,800 0 0
		Total, Agricultural Demonstrations ...	3,249 3 3

SHILLONG: Printed and published by H. H. KING, Superintendent, Assam Secretaria Printing Office;
(R. & G.) No. 126—480—5-11-1912.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 2926R., dated the 29th November 1912.

READ—

The Report of the Department of Agriculture of Assam for the year ending 30th June 1912.

RESOLUTION.

During the few months which have elapsed since the re-formation of the province of Assam good progress has been made with the strengthening and the re-organisation of the Agricultural Department in order that it may be fully equipped to meet the requirements of the province.

2. The experimental work carried out by Mr. Meggitt in collaboration with Mr. Birt at the Jorhat Agricultural station has been of the greatest value, and the Chief Commissioner trusts that, when the experiments now in progress have been carried to a successful conclusion, much benefit will result to the Tea Industry as well as to the ryots. Experience has shown that there is sufficient work for a whole-time Agricultural Chemist in this province, and steps have already been taken with that object.

3. The sanction of the Government of India has been accorded to the experimental appointment of two District Agricultural Officers, who are now undergoing a course of post-graduate training, at the conclusion of which in June next they will, should they show themselves to be qualified, be posted to the districts of Sibsagar and Sylhet. If the experiment proves to be a success, as is anticipated, the scheme will, subject to the sanction of the Government of India, be developed and an Agricultural Officer appointed to each district in the province.

4. Approval has been accorded to the establishment of an agricultural station in the district of Sylhet and steps have been taken to select a suitable site.

5. Crops in the province suffer much from the ravages of insect pests, and the need for an Entomological Collector has, therefore, been experienced. In order to supply this want an agricultural graduate is being trained in entomology at Pusa.

6. The desirability of granting scholarships in the Agricultural College at Sabour is at present under consideration and it is hoped that a decision will soon be arrived at in consultation with the Government of Bihar and Orissa. Sufficient scholarships will for the present be established for the training of the candidates required to fill appointments in the Agricultural Department, but, if zemindars and other big landholders are prepared to employ trained agriculturists, a larger number of scholarships will be provided.

7. The Chief Commissioner notices with pleasure the remarks of the Director regarding the extension of wet rice cultivation in the Naga and Lushai Hills. It is of the greatest importance that, both in the hills and plains districts, the wasteful system of *jhuming* should be replaced by a system of permanent cultivation, the people being assisted where necessary by agricultural advances to enable them to purchase plough cattle or implements. In this connection the Commissioner, Assam Valley Districts, has been asked to report on the feasibility of introducing plough cultivation among the Garos, and in the course of his recent tour on the North-East frontier, Sir Archdale Earle has impressed upon the Political Officer the desirability of encouraging the tribes under his control to adopt a system of permanent cultivat more especially in the plains portion of the frontier tract.

8. culture has not hitherto been a success in the Khasi Hills. The Wahja pical plantation has been discontinued, as the soil was unsuitable and the clin conditions unfavourable. The fruit farm at Shillong is being leased to the Roman Catholic Mission for the purpose of sericultural operations, as the site was too exposed for successful fruit growing. A new fruit garden is now being opened on a more favourable site, under the expert supervision of Mr. C. H. Holder, and there is every hope of its proving a success.

9. The Chief Commissioner has read with interest the account of the experiments undertaken in connection with sugarcane, potatoes, flax and buri cotton. The Department has already been successful in improving and extending potato cultivation. The success achieved by Srijut Debeswar Gossain with sugarcane is an indication that the efforts of the Department to improve this crop and to popularise better strains are beginning to be successful. Sir Archdale Earle cannot too strongly emphasise the fact that the success of an agricultural station must be measured by the extent to which it contributes to the adoption of improved methods among the neighbouring cultivators, and he desires that the results in this direction should be fully dealt with in the Annual Reports of the Department.

10. Operations for the improvement of livestock are at present mainly confined to the Khasi Hills, but Sir Archdale Earle hopes that, before long it will be possible to undertake systematic measures for the improvement of milch cattle in the plains. The subject is one of great importance in connection with the milk supply of towns. Mr. Blackwood, I.C.S., Director of Agriculture of Bengal, who was deputed by the late Government of Eastern Bengal and Assam to carry out a cattle survey in that province, will shortly submit his report on the subject, and a strong forward move will then be made.

11. The thanks of the Chief Commissioner are due to Mr. McSwiney for his administration of the Department since he has assumed charge, and to the officers of the Department who have so ably assisted him. Sir Archdale Earle also thanks Mr. McSwiney for his interesting report.

ORDERED—That a copy of this Resolution and of the Report be published in the Gazette for general information.

By order of the Chief Commissioner of Assam,

W. M. KENNEDY,

Second Secretary to the Chief Commissioner of Assam.

L34407
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REPORT

OF THE

SECRETARIAT BOMBAY LIBRARY

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

YEAR ENDING THE 30TH JUNE

1913.

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.
1913.

No. II-P-1—4811.

FROM

J. McSWINEY, ESQ., M.A., I.C.S., DIRECTOR,
DEPARTMENT OF LAND RECORDS
AND AGRICULTURE, ASSAM,

To

THE SECOND SECRETARY TO THE
CHIEF COMMISSIONER OF ASSAM.

Shillong, the 24th September 1913.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1913. It was due to you on the 15th instant: the delay in its submission is due to our having to wait for reports from Mr. Meggitt, Agricultural Chemist, Bengal, who is in charge of the duties of the Fibre Expert, in addition to his own duties, and, owing to pressure of work, could not send us his reports until the 15th instant.

I have the honour to be,

Sir,

Your most obedient Servant,

J. McSWINEY,

Director, Department of Land Records and Agriculture, Assam.

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

YEAR ENDING THE 30TH JUNE

1913.

CHAPTER I.

ADMINISTRATION.

Director.

1. I held the post of the Director of Land Records and Agriculture during the year. I was on tour in all 170 days up to 30th June, and was occupied with both Land Records and Agriculture, the former taking up most of my time during the cold weather. My main work on tour connected with agriculture consisted of (1) the selection of a site for the proposed agricultural station in the Surma Valley, (2) the inspection of the agricultural stations at Upper Shillong and Jorhat, (3) the inspection of two private farms at Baikuntapur and Dhubri and a sugarcane plantation near Tinsukia, (4) discussions regarding the milk supply of towns with leading men, (5) preliminaries in connection with the starting of the proposed sugarcane experiment in Kamrup, including attendance at the annual meeting of the General Committee of the Assam Valley Branch of the Indian Tea Association.

Deputy Director.

2. Mr. A. G. Birt, B.Sc., held the post of the Deputy Director of Agriculture throughout the year. He was on tour for 246 days, exclusive of visits to the Upper Shillong Farm, which he inspected frequently when at headquarters. He inspected the Jorhat Farm nine times and stayed there for a considerable time in the spring in connection with the sugarcane experiments. Two tours were undertaken in the Surma Valley in connection with the selection of a site for the Surma Valley Experiment Station, one in August and the other in November-December. In July he visited Goalpara and Kamrup districts in search of areas suitable for sugarcane growing, and, as a result of the information obtained, he revisited Kamrup in January, toured along the Bhutan frontier and made a rough soil survey of a tract about 100 square miles in extent. A report on the suitability of this tract for sugarcane growing on a large scale was submitted to the Agricultural Adviser to the Government of India, and as a result proposals have recently gone up for the initiation of a sugarcane cultivation experiment with steam tackle.

He inspected the paddy manuring demonstration centres in Sylhet, Sibsagar, Kamrup and Khasi and Jaintia Hills districts, the sugarcane demonstrations in Sibsagar, and the holdings of several Honorary Correspondents.

In connection with the denudation of the gorges south of Laitlyngkot in the Khasi and Jaintia Hills he visited several villages in that locality, drew up a report and arranged for a terracing experiment. Syndai (near Jaintiapur) was visited in May in connection with an outbreak of betel-leaf disease. At the request of the Jokai Tea Company several of their gardens in Lakhimpur district were inspected, and a report submitted as to the suitability of waste land for settling coolies.

Agricultural Chemist.

3. Mr. A. A. Meggitt, B.Sc., Agricultural Chemist, Bengal, worked in Assam throughout the year in addition to his work in Bengal. He was on tour for 190 days in Assam in the period under report, visiting Jorhat 5 times, Shillong once, and Baikuntapur once; he was for 10 days in Kamrup in connection with the proposed sugarcane experiment there. The Secretary of State has sanctioned a whole-time Chemist for the province and Mr. Meggitt will probably join the Department early in January next.

Subordinate staff.

4. Maulvi M. Fazlul Huq, a graduate of the Poona Agricultural College, who was under post-graduate training at the Jorhat Farm and had charge of the demonstrations in Sibsagar, was appointed Agricultural Supervisor on probation for three years with effect from June 1st 1913. Babus Binode Behari Das, B. Ag., and Satyendra Chandra Dutt, L.Ag., who were attached to the Shillong Farm for post-graduate training, were appointed probationary District Agricultural Officers of Sylhet and Kamrup from June 1st 1913, with headquarters at Karimganj and Gauhati, respectively.

U Herrick Singh and Srijut Binaram Das continued to be in charge of the Upper Shillong and the Jorhat Farms, respectively. U Harry Singh, Overseer, was in charge of demonstration work in the Khasi and Jaintia Hills. Babu Rukmini Mohan De, L. Ag., was attached to the Upper Shillong Farm as fieldman clerk until the end of March 1913, when he was appointed Superintendent of the Experiment Station in the Surma Valley. There are 5 demonstrators, of whom two are attached to Sibsagar district and 3 to the Khasi Hills.

Mr. C. H. Holder is in charge of the new Fruit Experiment Station at Shillong.

Expenditure and receipts.

5. The expenditure of the Department during the agricultural year ending on the 30th June 1913 amounted to Rs. 89,427-9-6, and the receipt to Rs. 6,494-7-6. The principal heads of expenditure are shown in Appendix III. This does not include the salaries of the Director and his office establishment, which are debited to "18 General Administration". As we are still in the experimental stage in most matters and have a backward population to educate, we cannot hope for much in the way of receipts for a long time to come.

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study in Primary schools.

6. The main scheme for imparting training to teachers of primary schools in nature study has not been initiated yet owing to difficulties mentioned by the Director of Public Instruction in his note which is reproduced herewith.

"The connection of the Education Department with Agriculture is indirect. The subject is not taught in any of the departmental schools.

"It is a common complaint that the influence of the literary education furnished by the schools and patsalas scattered throughout the country is unfortunate in this that the boy who has stumbled through the elements of a course in reading, writing and arithmetic tends to regard himself, on the immature completion of his studies, as having transcended the stages of society to which labour in the fields is appropriate. This is the natural consequence of centuries of tradition and can only cease altogether to be felt when literacy in the vernacular has become so general that its possession is no longer a differential qualification.

"Meantime the Education Department does what it can. Stress is laid in the syllabus for village schools upon object-lessons and on practical work in the school garden. This has been done in the hope that the village boys may so be taught to use their observation, to think for themselves, and to follow their hereditary calling intelligently and without discontent.

"While the extension of the school course on these lines cannot be quite void of effect, it cannot, for the present, do much to reconcile the conflict between literacy and labour. The patsala teacher is a feeble instrument of innovation or reform".

Messrs. Basu and Majid's Lower Primary Readers, which contain valuable lessons on nature study and agriculture, are taught in the primary schools: the village school masters are supplied with simple apparatus for the illustration of such lessons. The Education Department also supply seeds for school gardens. It must be remembered, however, that little can be done to spread sound ideas in agricultural matters through primary schools. The pupils are children of immature intellect and cannot be expected either to influence the practices of their fathers, which have been handed down from previous generations, or to remember much of what they have been taught by inefficient masters when they themselves undertake the position of head of the family.

Apprentices on Government Farms.

7. During the year under report two Khasi apprentices were under training for the post of fieldman demonstrator. One of them having completed his course of two years' training has been appointed a fieldman demonstrator in the Khasi Hills. At the Jorhat Farm two apprentices are under training. Two apprentices are sanctioned for the farm in the Surma Valley and they will be appointed when the farm has been put in working order. Two Khasi apprentices have been sanctioned for the Fruit Experiment Station at Shillong and they have since been appointed.

These apprentices are being trained in the laying out of experimental plots, the handling of implements, and the management of cattle, etc. They are made to take an active part in all agricultural operations on the farms.

In view of our requirements for trained demonstrators, proposals have been submitted to the Chief Commissioner to double the number of apprentices at the Jorhat and Surma Valley Farms. If these proposals are sanctioned, four trained men will be available annually instead of biennially.

Special short courses.

8. Two Lushai boys were under training at the Shillong Farm, of whom one completed his course during the year.

Sabour Agricultural College.

9. The Chief Commmissioner has sanctioned the grant of one agricultural scholarship of Rs. 20 per mensem at Sabour College in Bihar for three years. It was given to a Muhammadan candi late of the Surma Valley in the present year, but he, having found the course uncongenial, left the college shortly after joining: he objected to manual labour in the field. Another candidate, a Sylhetti Hindu, was selected instead, but he also left the college after a short time. It was then too late to send up another scholar. The real reason for this state of affairs is that the average Entrance-passed student has neither aptitude nor liking for agriculture. He strongly objects to any form of manual labour and is not even willing to undertake the minimum amount of practical work on the farm attached to an agricultural college necessary to enable him to get a grasp of the principles of agriculture. We have decided that in future no student will be sent to college who has not spent at least a year on one of the experiment farms and gained some experience of practical work.

Post-graduate Training.

10. Three agricultural graduates, two of Poona and one of Nagpur, were under practical training on the experiment stations. Another, a graduate of Poona, was deputed to the Agricultural Research Institute, Pusa, to undergo a course of training in Entomology for one year: he is due back in November next, and, if recommended by the authorities at Pusa, will probably be appointed Entomological Assistant.

CHAPTER III.

EXPERIMENT AND RESEARCH.

Agriculture.

Soil Improvement Investigations.

11. The experiments mentioned in last year's report were continued and extended at Jorhat. The results obtained confirm the previous years' results as to the value of lime and green manure on this acid high land soil. A detailed account of this work is given in the report of the Jorhat Experiment Station and the chemical side of the experiment is discussed in the Agricultural Chemist's note appended to this report. During the year a new experiment was laid out to test the effect of ground limestone on this soil.

Sugarcane.

12. The variety tests and planting experiments were continued at Jorhat. This year's results for plant cane far surpass any hitherto obtained. One plot of B. 147 yielded practically 4 tons of total sugar per acre, while the average sucrose (cane sugar) in the four best varieties, B. 147, B. 208, B. 376 and Striped Mauritius, worked out at over 3½ tons per acre. The results are especially interesting this year owing to the fact that this crop is the first in the second round of the rotation. In 1908-09 the same land was under cane and was given a heavy dressing of manure. Notwithstanding this, the crop was so poor that it was not considered worth harvesting experimentally. In 1909-10 the cane was ratooned, but the results were not at all satisfactory. The land was then given a dressing of lime; a crop of *aus* paddy was taken in the rains of 1910, followed by *matikalai* in the cold weather. This was succeeded by cowpeas for green manure

in 1911, thus completing the four year rotation. Briefly this rotation which has been followed for the last five years is as follows :—

1st year plant cane (500 maunds cowdung).

2nd year ratoon cane (20 maunds oil-cake).

3rd year { *kharif*—*aus* paddy. / *rabi* —*matikalai*.

4th year { *kharif*—green manure (cowpeas). / *rabi* —fallow.

The results obtained this year fully justify the adoption of this rotation, and also emphasize the remarkable effects on the soil of green manuring in conjunction with liming. In 1910 this land was undoubtedly the worst on the farm, yet in 1912-13 it produced the best crop of cane we have ever had, one of the varieties (B.147) yielding three times, and three other varieties more than double the amount of sugar per acre obtained in 1910. Incidentally it should be noted that these results refute the idea which appears to be prevalent with many people in this province, *viz.*, that sugar-cane can only be profitably grown on the same land once or twice in about 7 years. From our experiments it is obvious that, if the land is treated properly and put under a suitable rotation, sugar-cane can be grown two years out of four.

The results of the planting experiments indicate that between 7,000 and 8,000 sets is the optimum rate per acre. The reduction of this amount by wider spacing of rows, while increasing the crop per row, diminished the crop per unit area. Wider spacing of rows than 3 feet would probably be necessary for cultivation by machinery, so the problem now to be worked out is the number of sets required in the wider row to give the maximum crop.

These experiments are being continued, and, in addition, the manuring problem has been taken up. Full particulars of this year's results are given in the report of the Jorhat Farm.

Potatoes.

13. At Upper Shillong experiments with potatoes were continued. They included trials of varieties, summer *versus* winter seed, cut sets *versus* whole sets, and manuring with cowdung and phosphates. Of the old stock obtained from England, King of Potatoes again gives the heaviest yield and, in addition, is less susceptible to disease than the other varieties : Magnum Bonum also did well. Of the varieties more recently imported Up-to-Date and Imperator are the most promising.

Winter seed again gave very much better results than summer seed, thus confirming previous years' results. These results have been so definite and consistent that it may now be taken as an established fact that winter seed is some 50 per cent. more productive than summer seed.

The season was bad for the potato crop on account of the drought in April. The cultivators' crops were very poor, in some cases scarcely returning the seed. On the farm, although the average yield was lower than usual, the crop did not suffer to anything like the same extent, the main reason for this being the more thorough methods of cultivation employed in the farm, where deep ploughing is done with an English plough. The deeper cultivation undoubtedly assisted to conserve the soil moisture and thus saved the crop.

A full account of the potato experiments is given in the report of the Upper Shillong Farm.

Rice.

14. Experiments on this crop cannot be undertaken in the plains until the new farm in the Surma Valley is in working order. At Shillong experiments were laid out to test the effect of bonemeal against flour-phosphate and transplanting of seedlings against the usual method of broadcasting seed. If transplanting proves successful, it will mean a saving of about 75 per cent. in the seed rate. The crops will not be harvested until after this report is published.

Green manure crops.

15. At Jorhat green manuring with cowpeas once in a four years' rotation was continued with success. Small areas of dhaincha and sunn-hemp were also grown for trial successfully. This year small areas of velvet beans and sword beans, two crops which are used for green manure in America, are being tried on a small scale. At present they appear to be very promising.

Fodder crops

16. At Upper Shillong a large number of exotic fodder crops were tried. With the exception of perennial rye grass, all the grasses and clovers failed. Lupins are doing fairly well, and Swedes

are making a small crop. Mangels and sugar beet failed to germinate. It seems to be useless to experiment further with these crops. Fortunately we have three local crops which are capable of providing excellent fodder for the winter. These crops are maize (for silage) and *raishan* and soybeans (for hay).

Other crops.

17. Manchurian soybeans were tried on a small scale at Jorhat with great success, the yield being over 18 maunds per acre. Other crops tried at Jorhat were groundnuts and potatoes. The groundnuts produced a fair crop, but much of the produce was eaten by rats in the field. Potatoes gave a poor yield.

At Shillong five varieties of American maize are being grown, but only two are doing well.

Fruit.

18. The Fruit Experiment Station at Umlyngka near Shillong having been found unsuitable for the purpose, was abandoned last year, and a new garden opened on a better and more sheltered site under the supervision of Mr. C. H. Holder of Shillong. An area of 35·6 acres has been reserved, of which 5 acres have been cleared and European fruit trees planted on 3½ acres. The total expenditure up to June 1913 amounted to Rs. 15,633-14-1, of which Rs. 1,250 was for Mr. Holder's allowance. A full account of the work done up to date is given in the report of the station for the year ending June 30th 1913 published separately. So far as the experiment has gone, it seems very probable that good European fruit can be grown in the Khasi Hills and it is possible that in the next generation good apples, pears and peaches will be exported in large quantities to the plains.

(*ii*) *Agricultural Chemistry.*

19. A note by Mr. Meggitt on the work done by him in Assam is reproduced in Appendix I. His attention was directed mainly to :—

1. Sugar-cane work.
2. Soil investigation.
3. Green manuring.

The first involved the chemical control of the experimental cane work at Jorhat. The second item consisted of (i) the continuation of field and laboratory work in connection with the manurial and rotation work at Jorhat, (ii) field experiments in the use of raw mineral phosphates, (iii) experiments in the use of finely ground limestone as a substitute for burnt lime, (iv) field work connected with the remarkable action of lime on the soil at Jorhat. The third item included work in connection with dhaincha, sunn-hemp, Manchurian soybeans and cowpeas.

Besides the above, Mr. Meggitt undertook the examination of the soils in the area selected for the sugarcane experiment in Kamrup, an examination of the effluent from the Jorhat distillery, and preparation of plans for building and equipping a chemical laboratory at Jorhat.

During the year the Chief Commissioner has sanctioned the erection of this laboratory. I am afraid that it will not be completed until well on in next year. With the laboratory and an Agricultural Chemist of our own, we should be in a sound position for future work. The results at Jorhat show the absolute necessity of chemical work in this province.

CHAPTER IV.

DISSEMINATION.

Section I.—Demonstration.

Localities.

20. Demonstrations were carried out in four districts, *viz.*, Khasi and Jaintia Hills, Sibsagar, Sylhet and Kamrup. U Harry Singh, with the assistance of 3 demonstrators, is in charge of demonstration work in the Khasi and Jaintia Hills. The Agricultural Supervisor is in general charge of demonstrations in the Assam Valley, assisted by the District Agricultural Officer in Kamrup and by two demonstrators in Sibsagar. In Sylhet the demonstrations are being carried out by the District Agricultural Officer.

Rice.

21. Manurial demonstrations with bonemeal and flour phosphate were commenced in the Khasi and Jaintia Hills, Sibsagar, Sylhet and Kamrup, at 10 centres in each district. In every case the demonstrations are located on actual cultivators' holdings. The first year's results will not be available until the end of the year.

Sugarcane.

22. The superiority of B. 376 from the Jorhat Farm over the local varieties, Magh and Teli, was demonstrated on cultivators' holdings in 12 centres in Sibsagar district. In nine centres the yield of *gur* from B.376 was from 23 per cent. to 150 per cent. better than that of the local varieties, while in five centres it was over 90 per cent. better, the average for the nine centres being an increase of 83 per cent. In the remaining 3 centres equal weights of B. 376 cane were compared with equal weights of the local varieties with the result that B 376 produced on the average 0 per cent. more *gur* than the others. The results of these demonstrations are already beginning to take effect, as witnessed by the fact that we had more applications for sets of improved varieties of cane this year than we were able to deal with.

In order to popularise the use of the iron roller crushing mill in the place of the old wooden mill, six iron mills were sent out in charge of demonstrators. One cultivator has offered to purchase two of the mills and many others have expressed a desire to do so. The chief difficulty appears to be the initial outlay, which is about Rs. 60 for each mill. Most cultivators grow cane on only a very small scale and cannot afford to purchase a mill for their own use. There is apparently a good opening here for co-operative credit societies to advance money for the purchase of mills. Probably the best system for small holders would be for one man to purchase several mills and hire them out to the cultivators. Next year it is proposed to send at least 12 mills out into different parts of the district for further demonstration purposes.

Potatoes.

23. Arrangements were made in the Khasi and Jaintia Hills district to send out 12 expert sprayers to spray the cultivators' crops with Bordeaux Mixture, as a preventive of the potato disease (Phytophthora infestans). It was expected that each machine would deal with about 20 acres of potatoes, or about 240 acres in all, but the season proved to be a very bad one for potatoes owing to the drought in the spring, and in consequence the majority of the cultivators were unwilling to incur any extra expense on a crop which was apparently already doomed to failure. Thirty-two acres only were sprayed, the result on only 9 acres being reported as succesful, the crop on the remaining area having suffered too severely from the drought to benefit from spraying.

The people already realize the benefits of spraying in an average season, but the difficulty is to get them to incur the initial outlay for the spraying machine. It is therefore proposed to send out expert spraying coolies annually to spray the crops of all cultivators who wish to have it done, the actual cost of labour and materials being charged to the cultivators.

In the Lushai Hills 50 maunds of Nainital seed potatoes were obtained, of which 20 maunds were sown in the Government potato garden at Hmuifang and the remainder distributed among villages with land suitable for potato growing. Rats did considerable damage to the crop. About 4½ maunds of English seed potatoes were also sown at the garden. The crop was destroyed by rats again and only 30 maunds were cropped. The Superintendent reports that he obtained 40 maunds of Burdwan seed potatoes, of which 7 maunds sown and the rest distributed to villages in Aijal subdivision. The Superintendent has been asked in future to obtain seed from the Upper Shillong Farm, as we can guarantee it good and pure and the climate of the Lushai Hills is more like that of Shillong than that of the plains.

In Mokokchang subdivision potato seed from Upper Shillong was distributed to some villages. The Deputy Commissioner, Naga Hills, reported that the crop was fairly successful and this has led to a demand for more seed, which will be supplied.

Terrace cultivation.

24. In connection with the denudation of the gorges on the southern side of the Khasi and Jaintia Hills caused by jhuming about half an acre of sloping land in this tract was laid out in terraces, with the object of eventually inducing the people to adopt this method of cultivation instead of jhuming. Raitruh (a local millet), sweet potatoes and maize have been planted; the results remain to be seen.

The land under wet rice cultivation in Champhai and North Vanlaiphai valleys in the Lushai Hills again produced good crops this year and no damage by rats was reported. There are about 525 houses cultivating by this method at and near the valleys. Fifty houses started wet rice north of Kolosib, but their seedlings were damaged by rats, and therefore the outturn was very poor. Permission has been given by the Superintendent to many Lushais to start wet rice cultivation this year. The Subdivisional Officer, Lungleh, remarks that wet rice cultivation is becoming

popular in his subdivision, but suitable land is scarce. The Superintendent of the Hills is of opinion that the Lushai will not take up terraced cultivation so long as he can get land to jhum on account of the labour involved in making terraces, but he will be driven to it eventually.

The Deputy Commissioner, Naga Hills, reports that wet-rice cultivation is extending slowly in Mokokchung subdivision. The Semas have appreciated its advantages, but have not fully grasped the proper method of retaining the water on the fields.

Fruit.

25. Demonstrations in fruit culture are being carried on in the Khasi and Jaintia Hills, the Lushai Hills and the Naga Hills and in the gardens of Honorary Correspondents in the plains.

Last year the fruit garden at Umlyngka near Shillong, which contains a large number of mulberry trees, was leased to the Roman Catholic Mission, with a view to train Khasi boys in sericulture; the Mission employed them also in nursing the fruit trees left on the garden by this Department.

Two demonstrators were sent out to instruct owners of orchards in the Khasi Hills in grafting. Many villages were visited by them and 333 grafts were made, of which 138 were pears, 4 apples, 93 peaches, 40 oranges, 31 plums and 27 apricots.

At Tissama garden in the Naga Hills some additional fruit trees were planted. The Deputy Commissioner reports that they were damaged by hail in March and suffered considerably.

The Superintendent, Lushai Hills, has been actively pushing the introduction of fruit trees. In 1912-13, 10,114 orange plants were distributed to villages which take an interest in fruit growing, and 8,000 seedlings were raised locally for distribution. Some fruit trees including plum, wild plum, sapota, loquat, peaches, mangoes and lichis have been grown in the Sairang garden from grafts planted in 1910 and 1911: the Agricultural Instructor has been trying to graft oranges on country lemon cuttings.

Demonstrations by Honorary Correspondents.

26. Babu Jnan Chandra Ray, Honorary Correspondent, Nowgong, obtained some Bombay jute seed from the Dacca seed depôt and distributed it among the Mikirs. He expects the resultant crop to yield an outturn of 500 maunds of jute.

Srijut Deveswar Goswami, Honorary Correspondent, Sibsagar, made experiments with wheat, cane, *aus* dhan and beans, which he reports to have been successful.

U Bordhan Ray Kanti cultivated coffee and obtained 40 maunds during the year. He reports that the people in his neighbourhood are taking to coffee cultivation and seedlings have been planted extensively.

U Job Solomon, Honorary Correspondent, Khasi Hills, has a tropical fruit farm where he has planted varieties of mango grafts obtained from Calcutta and Darbhanga and grafts of lichis and Bangalore papiya seeds.

Maulvi Tyab Ali, Honorary Correspondent, Kamrup, has a fruit garden at Beltola and has taken up another garden of about 150 bighas in area at Sonapur; he has planted bananas, oranges, thornless pineapples and grafts of lichis and apples.

Section II.—Aid to the public.

Aid in combating insect pests.

27. Since the close of the year an Honorary Correspondent sent a report of the advent of *Lohajuri* insect, known as "Rice hispa," on the paddy land in the western side of Habiganj subdivision. Instructions to combat the insect were sent to him departmentally and the Subdivisional Officer, Habiganj, was asked to report as to the extent of damage. The Subdivisional Officer has replied that the recent floods submerged the whole crop and the result was that the plants attacked by the insects were destroyed along with the surrounding crops. The Naga Hills suffered also from a plague of small flies found in myriads on the millet, Job's tears. Specimens of apparently the same pest were recently received from the Manipur Durbar and sent to Pusa for identification and advice.

Specimens of lichi leaves sent in by Mr. Gilman, Honorary Correspondent, Kamrup, were found to be attacked by "Lichi leaf curl." Instructions were given as to treatment.

28. In the Naga Hills field rats caused a good deal of damage. A bulletin on the destruction of field rats, published by the Agricultural Department of the Federated Malay States, was sent to the Deputy Commissioner, Naga Hills, and to the Superintendent, Lushai Hills, where a plague of bamboo rats had been causing considerable damage for some years. The methods recommended in the bulletin did not commend themselves to either of these officers.

Other pests.

29. The only diseases reported during the year were:—

Fungus diseases.

(i) the potato disease,
(ii) orange blight, and
(iii) a disease of betel leaves (pan).

The first is dealt with under the head of spraying demonstrations.

The orange blight has been prevalent on the southern slopes of the Khasi Hills for many years. Its origin is still obscure and no remedy has yet been discovered. On the advice of the Imperial Mycologist grafting is being tried on citrus stocks, which are more hardy and less liable to contract the disease. Owing to the difficulty of obtaining suitable stocks only about 40 grafts could be made this year.

A disease attacking the betel vine was reported from the southern slopes of the same hills. Specimens of diseased leaves were forwarded to Dr. Butler, who reported as follows:—

"The disease is undoubtedly due to a fungus, a species of the genus Colletotrichum (to which the fungus responsible for red-rot of sugarcane belongs), possibly identical with Colletotrichum necator Massee, recently described as attacking "pepper" (probably piper nigrum) at Singapore.

This disease has been observed by me in Madras, Bombay and Burma and is evidently widespread. The symptoms appear to be similar in all cases, though the Assam attack appears to be more severe than elsewhere.

The fungus has now been obtained in pure culture and inoculation experiments with it will shortly be commenced. Their results will be reported in due course."

Since then we have heard that the disease could not be reproduced artificially, and we are sending some more vines to Pusa.

On Dr. Butler's advice spraying with Bordeaux mixture is being tried. Diseased plants in four gardens were sprayed in December with encouraging results. These plants were sprayed again in May, but owing to heavy rains this second spraying will probably not have much effect. In order thoroughly to test the value of spraying with Bordeaux mixture, a pan garden, which was abandoned on account of this disease, was taken over from the owner. In all 56 effected vines were sprayed in May and will be sprayed again at the end of the rains. If the treatment proves successful, these experiments will be a great boon to large numbers of cultivators, as the cost of spraying amounts to only ½ anna to 1 anna per vine, while the annual value of the produce obtained from an average vine is from 6 to 8 annas.

30. At present there is no seed depôt in this province. It is proposed to open a small godown at Gauhati for the supply of seeds implements and manures shortly.

Seed supply.

During the year the following seeds, manures, etc., were supplied to the public:—

Sugarcane cuttings (chiefly B. 147) from Jorhat Farm	15,000	
Fruit trees (principally oranges)	256	
Potatoes	635	mds.
Plants from Shillong Nursery	1,619	
Bonemeal (Khasi and Jaintia Hills)	203	mds.
Ditto to Honorary correspondents	9	,,
Spraying pump	1	

For the purpose of supplying bonemeal in the Khasi and Jaintia Hills at reasonable rates, a bone crushing plant has been purchased and will shortly be installed at the Upper Shillong Farm. Arrangements have been made for the supply of 1,000 maunds of bones for the ensuing year. When this plant is working we shall be able to supply bonemeal at a small profit at about Rs. 3 per maund as against Rs. 4-8 to

Rs. 5 per maund, the present cost of Calcutta bonemeal delivered in the hills. The reduction in price should give a great impetus to the use of bonemeal as a manure for rice in the hills.

Section III.—Sericulture.

In the Khasi Hills.

31. Sericulture operations, which have been transferred to the Roman Catholic Mission, were undertaken at the abandoned fruit experiment station at Umlyngka near Shillong. Rearing commenced at the beginning of March with six ounces of var seed, but it was not so successful as in the past. The failure is attributed to insufficient ventilation and damp cold arising from the cemented floor of one of the three houses used for rearing: a great number of the worms in that house got diseased and died. At the request of the Mission an attempt was made in May last to procure a man from Bengal to teach their boys the art of reeling, but that being the sowing season we failed to procure anyone. Arrangements are being made to depute two Khasi boys to Bengal to learn reeling.

An Honorary Correspondent in the Khasi Hills reared some *eri* worms and induced three persons to do the same under his supervision. He is also making endeavours to grow castor plants.

Two Khasi students, who had been trained in the Rajshahi Sericultural School, having undertaken sericulture, were each granted a microscope and a reward of Rs. 250 to assist them in building a rearing house and in laying out a mulberry plantation.

In the plains.

32. Rai Bahadur Bhupal Chandra Basu, late Deputy Director of Agriculture, Eastern Bengal and Assam, was deputed in last June on special duty to enquire into the present condition of the silk industry in Assam, with a view to the introduction of improved methods of rearing, reeling and disposal of the finished article. His report is expected in the spring of 1914. I think that the most promising lines of progress will lie in developing co-operative societies of silk rearers, and the Rai Bahadur's previous experince of these societies and his thorough knowledge of agricultural conditions should add considerable weight to his recommendations. It has always seemed to me that the previous attempts to improve silk cultivation in the plains did not start at the right end, while the subsequent efforts to introduce exotic silk in the hills were a needless diversion of energy. We have got an existing industry in the Brahmaputra Valley, and it seems to me that, if anything in the way of sericulture is to be undertaken, we are bound in the first place to improve and place on a sound basis what exists rather than strive to create what is possibly not required.

Section IV.—Agricultural Shows and Exhibitions.

Shillong agricultural and flower shows

33. As intimated in paragraph 36 of last year's report, a separate Flower Show was held in May 1913, under the management of a local committee. The Agricultural Show for the Khasi Hills was fixed for 1st September, a date much more suitable for the crops grown, and, it may be mentioned here, was a huge success, so that our date was well justified.

The annual meeting of agriculturists in the Khasi Hills was held as usual at the Upper Shillong Farm on 3rd July 1912. The Associates of the Khasi Hills together with Siems, village headmen and others, who take an intelligent interest in agriculture, attended the meeting. They were shown over the farm and took great interest in the new varieties of potatoes, which were being harvested, and also in the cattle and sheep. Afterwards they were entertained to tea and a general discussion took place on the improvement of agriculture in the district. These hill people are a striking contrast to the ordinary plainsmen in the keen and active interest they take in agricultural matters.

Section V.—Agricultural Associates and Honorary Correspondents.

Honorary Correspondents and Associates.

34. At the close of the year there were 25 Correspondents against 20 in the Preceeding year, of whom three held the post of Associate. I am afraid that, with a very few exceptions, our Correspondents are not practical men: those mentioned above in paragraph 26 have shown activity, but the majority of our plains Correspondents belong to the literary class, who have little or no knowledge of practical agriculture and who occasionally show such a lamentable ignorance of what is possible that we are reduced to dispair. Until the average cultivator becomes more educated or until the educated classes seriously take to agriculture as a means of livelihood, we cannot expect any other result. In striking contrast to most is Babu Lalit Mohan Dutta of Dhubri, who is a genuine farmer and manages a farm growing rice and jute on thorough business-like lines. If the educated classes of Bengal followed his example in greater numbers, the problem of the unemployed *bhadralok* would be solved.

Honorary Correspondents are given free gifts of seeds and manures ordinarily to the value of Rs. 50 (excluding freight) when they agree to make a demonstration with the approval and under the supervision of the Department; and when they propose to make experiments on their own account, they are supplied with seeds at half cost, provided the total cost (excluding freight) during any one year does not exceed Rs. 25. Some of them took seed and made experiments and the results obtained are noted in Section I.

A list of the Honorary Correspondents and Associates is given in Appendix II. I hope that the Agricultural Supervisor and the two District Agricultural Officers in Sylhet and Kamrup appointed in last June will be able to help in developing the efforts of Associates and Correspondents in their districts and to keep them in touch with the improvements established by experiments in our Agricultural Stations. Though we have Honorary Correspondents in practically every plains district, and though no real good is effected until our experiments get outside the boundaries of our farms and penetrates to the raiyats, either through Honorary Correspondents or otherwise, I think that our main efforts to this end must be made by the recruitment of a large number of fieldmen demonstrators working direct under our supervision. We shall, of course, continue to do our best to attract Honorary workers, but the prospect of our securing in the plains really serious advocates of improved agricultural methods is not at present particularly bright.

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

Cattle breeding.

35. The herd of Patna cattle was maintained at the Upper Shillong Farm, the total head of stock being 56 at the close of the year. During the year 22 animals were sold: of these, 12 were breeding bulls 3 years old. Four of these went to the plains and the remainder were sold to the Khasi cultivators. Ten animals were cast from the herd; eight of these were weedy, young bulls, the remainder being two old Bhutia cows.

We are still awaiting for the report on the special enquiry into cattle breeding held in Eastern Bengal and Assam in 1911-12. I understand that Mr. Blackwood, who has been Director of Agriculture, Bengal, since May 1912, hopes to complete this report in next month (October). The whole question will be discussed at the meeting of the Board of Agriculture next December and I hope that we shall be able to submit some definite proposals by next year.

Sheep breeding.

36. The experiment of crossing Khasi ewes with dumba rams was continued at Upper Shillong. The total number of sheep on the farm at the close of the year was 171: six cross bred rams were sold during the year. A small flock of pure bred dumba rams was imported from Baluchistan and distributed as below :—

Mr. D. Ferguson	1
Subdivisional Officer, North Cachar Hills	1
Deputy Commissioner, Shillong	2
Upper Shillong Farm	2

Twelve dumba ewes were also obtained for the Upper Shillong Farm. It is proposed to attempt breeding pure dumba rams for distribution.

Two Baluchi goats were imported at the request of the Subdivisional Officer, North Cachar, who intended to use them at Haflong for stud purposes. After the close of the year under report I decided to transfer them to the Political Officer, North-Eastern Frontier, who is likely to make much better use of them than is being made at Haflong.

Poultry breeding.

37. Poultry breeding under Government control continued at Aijal under the supervision of the Superintendent, Lushai Hills. His report of the operation for the year under review is reproduced here :—

" Again, owing to the scarcity of food, the distribution of fowls and eggs from the farm was not extensive. For the same reason the hens in the farm could not be well fed and consequently did not lay as well as formerly. The total number of eggs obtained this year was 3,155, of which 2,342 eggs were distributed to Lushais and others at annas 2 and 6 pies. The rate was reduced by Mr. Henniker in consideration of the condition of the people. The price of 567 eggs is still outstanding : 534 eggs were used for hatching, out of which 169 were broken : 974 eggs were obtained from Lushai fowls, out of which 826 eggs were sold at 6 pies each and the remainder used as food for the chickens : 2 ducks and 56 fowls were sold. The sale proceeds of the farm amounted to Rs. 316-4-0 against Rs. 798-1-0 in last year.

" The total number of chicks hatched this year was 236, of which 155 died. Twenty-four hens and 6 cocks were imported from Chittagong and 53 fowls bought locally. There are now in the farm 243 birds, consisting of 5 varieties, Chittagong, Langshan, Buff-Orpington, Buff-Orpington crossed with Chittagong, and Wyandotes, and about 10,000 imported birds and 5,000 cross bred birds in the district. The reason for the fall in number of crossed birds is that Lushais now prefer pure bred birds.

" The total cost of the operations was Rs. 1,739-9-11 against Rs. 1,846-12-11 in last year (1912-13), of which Rs. 1,544-0-5 went in current and Rs. 195-9-6 in capital expenditure."

The fowls of Chittagong and Langshan breeds, mentioned in paragraph 34 of last year's report as imported by Mr. Allen in 1911 from the Lushai Hills, were sold to Khasi breeders in the villages round Shillong : they are reported to be progressing satisfactorily. They were sold for under Re. 1 each, though they were valued at Aijal at Rs. 2-8-0 each. It would appear that the Khasis think, probably with good reason, that their fowls are quite good enough, or it is possible that the simultaneous sale of such a large number brought down the price.

People wishing to import fowls or eggs from Aijal should communicate direct with the Superintendent, Lushai Hills, and they will generally be satisfied with their purchases.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications.

38. A report on the work of each Agricultural station is published annually in the autumn. One leaflet on 'Paintiaphi' a rice pest for the Khasi Hills was published in English and Khasi during the year. For the forthcoming meeting of the Board of Agriculture the Deputy Director of Agriculture has written two notes on sugarcane and rice in Assam.

The soil work done on the Jorhat Farm is so important that I intend sending copies of the report on that station for distribution to the two local branches of the Indian Tea Association. I hope that sometime in the near future we shall be able to publish separately a fully illustrated report on the work of Messrs. Meggit and Birt on this head, which should be very useful to all persons engaged in agricultural pursuits in Assam.

Statistical publications.

39. Crop forecasts, weekly and annual season and crop reports, the annual reports on tea culture, rail and riverborne trade, and frontier trade, periodical returns of rainfall, prices and trade, and all agricultural statistics were as usual published by the Department. The output of these publications is a heavy tax on my office, which I think publishes more periodical reports than any other department in the province.

Supply of information.

40. Honorary Correspondents were supplied free with copies of all departmental publications and reports and were furnished with information and advice on agricultural matters when required. Requisitions asking for information relating to the agriculture, sericulture and commerce of the province were received from private individuals and concerns and complied with.

Co-operation with the Economic Botanist to the Botanical Survey of India.

41. At the request of the Economic Botanist the following collections were made and enquiries undertaken :—

(1) Enquiry as to the origin, cultivation and use of the Florida velvet bean,
(2) Collection of edible fungi from the Khasi and Jaintia Hills,
(3) Collection of specimens of *Canavolia*,
(4) Supply of roots and botanical specimens of certain dye plants from Manipur, Sylhet and Goalpara.
(5) Collection of ferns, whether used as a *sag*, a medicine or otherwise grown in the province.

The Deputy Commissioners and some Honorary Correspondents rendered valuable assistance in these collections and enquiries.

CHAPTER VII.

MISCELLANEOUS.

Hand-loom weaving.

42. As observed in the last report, in September 1912 the services of the Weaving Instructor, Bengal, were secured for two months through the courtesy of the Director of Agriculture, Bengal. The services of the Instructor, Mr. Narayan Pillay, were first lent to the Meches of Goalpara, to whom he demonstrated improved methods of hand-loom weaving. He also opened regular weaving classes at Malotijhora to teach them the use of the automatic fly-shuttle loom. Mr. Pillay demonstrated the use of the Salvation Army loom to many weavers and there was a large gathering of Meches to witness the demon station. He trained 7 weavers, of whom 5 were women.

Besides the teaching of the use of Salvation Army loom, the Instructor also demonstrated and taught them how Mech clothes could be woven on their own hand looms by the introduction of improved appliances so as to facilitate labour and time. That the Meches at Goalpara readily adopted the improvements suggested by Mr. Pillay is evident from the fact that they ordered for three Salvation Army looms and for other improved appliances.

The Instructor next went to Panchakanda in Karimganj subdivision, Sylhet. He constructed or took there some improved loom accessories; these improvements together with the fly-shuttle loom and the Salvation Army loom were demonstrated to many weavers, from amongst whom 5 were selected and given a thorough training in all the new processes. In view of the success that attended Mr. Pillay's work a Weaving Master has been appointed, with the sanction of the Chief Commissioner, for three years. A set of provisional instructions has been drawn up for the work. The Weaving Master will be provided with looms and accessories for demonstration work. The present incumbent of the post is a young man, new to his work, but he is doing well so far. My intention is that he should tour in the villages and improve, in a practical and cheap fashion, the methods he finds in use. I do not think that he should be detained in girls' schools in towns : the pupils of these schools are usually the children of well-to-do people, who would like to take up fancy work. But I want to get to rock bottom and improve the weaving of the wife in the mufassil, who in Upper Assam yet weaves in cotton or silk her husband's dhotis and her own riha-meklas.

On the basis that local instruction offers the best opportunity of imparting a really practical training to weavers, the scholarship tenable in Eastern Bengal and Assam at the Serampore Weaving Institute has been withdrawn.

Miscellaneous.

43. In February last a grant of Rs. 500 was given to the Political Officer Central and Eastern Sections, North-East Frontier, to introduce terraced wet rice cultivation : two maunds of

paddy from the Naga Hills were also supplied. A programme of agricultural work in the North-Eastern Frontier has recently been arranged in consultation with the Political Officer, and has been submitted for sanction.

The annual grant of Rs. 1,000 for the purpose of experimental cultivation, mainly the introduction of wet rice, in the Lushai Hills has been continued for a further period of three years from 1st April 1913. The Superintendent remarks that much attention to experiments could not be paid during the year owing to scarcity.

The sum of Rs. 500 allotted to the Naga Hills for experimental terrace l cultivation was given to certain villages who have extended their old fields or started new ones.

A contribution of Rs. 10,000 was given to the Indian Tea Association for the experiment station at Tocklai.

General Progress.

44. I am now approaching the end of the second year of my charge of the Agricultural Department in Assam and can afford to take a view of its position. Last year was spent in settling down to our independent position and in preparing plans for what we were to do. We are on the way to being provided with a proper staff and equipment With two Indian Agricultural Service Officers, one Agricultural Supervisor, two District Agricultural Officers, one Entomological Assistant, one Overseer and five Demonstrators we have the nucleus of future developments. In the near future we shall probably require an Agricultural Supervisor for each of the two Commissionerships and after that a Second Deputy Director. In the meantime we have to expand our subordinate staff of fieldmen demonstrators. The only class of officer that I am not satisfied with is the District Agricultural Officer. He is the result of a proposal made in 1910 in Eastern Bengal and Assam to appoint a service of Agricultural Overseers under District Boards, whose duties would be (1) the organisation and supervision of demonstrations, (2) the charge of experiments undertaken by District Boards, (3) the collection of agricultural information, and (4) the development of confidential relations with the cultivator. The Commissioners' Conference of that year approved of the proposal, but were divided in opinion with regard to placing the incumbents under District Boards, and advised that they should be entirely under the orders of the District Officers. His Honour the Lieutenant-Governor decided that for the present the appointments should be made by the Director of Agriculture and be paid for by Government, and the Government of India gave a somewhat reluctant sanction to the scheme, limiting it to two or three districts, making the appointments temporary and asking for a report on the results at the end of two years. These officers are nothing more or less than Agricultural Inspectors, a class of appointment well recognised in other provinces: the suggestion that they should be entirely under the orders of the District Officer arose as a compromise from the original proposal to make them District Board officials and so permanently attached to the district. There is no more reason why Agricultural Inspectors of demonstrations should be under the Deputy Commissioner than other professional subordinates, such as those of the Public Works Department, the Forest Department and the Medical Department. The Deputy Commissioner has no technical knowledge of agriculture and must either fall back on the Deputy Director of Agriculture or let his district agricultural subordinate do what he pleases. I confess that I am responsible for the appointment of the two officers bearing this title in Assam: I made the mistake of using the nomenclature sanctioned in Eastern Bengal and Assam, but I protested against their subordination to the Deputy Commissioner. A modification of my proposal, in that, though subordinate to the Deputy Commissioner, these officers would be under our general control, was forwarded to and accepted by the Government of India. As the latter require a report on the scheme by next June, I wish to record here my decided opinion that the scheme of control sanctioned in Eastern Bengal and Assam should be absolutely abandoned: it was a compromise which, like many other compromises, was neither "fish, flesh, fowl or good red herring". We want to get in touch with the people: we shall do this through fieldmen demonstrators: the latter must be controlled and inspected, and I think that this can be done best by Agricultural Inspectors, who, as professional or technical officers, should be as much subordinate to and part of the Agricultural Department as Public Works Sub-Engineers are an essential part of the Public Works Department. I have no wish to diminish the power or influence of the Deputy Commissioner, but I claim that adding agriculture to his many heavy duties is a hopeless mistake. I may add that I understand that the Director of Agriculture, Bengal, considers the District Agricultural Officers appointed in Eastern Bengal as failures and the scheme will probably be abandoned there.

The general attitude of the educated public towards our Department and their ideas of what our objects should be are a continual stumbling block: in the educated public I include most Europeans, non-official and official. Indians and Europeans seem to think that the main, if not the sole, object of the Agricultural Department in this country is to grow fruit: they talk continually of mangoes, lichis and pine-apples. Many Europeans would add the cultivation of vegetables as an important function and some would put it before that of fruit. A few European ladies think that we should supply pure milk, even if we did, as they suspect, nothing else. Some people would have us introduce long stapled cotton as an improvement, altogether forgetting that the short-stapled article grows well, has a good market and brings in a large and constant income; while it is more than probable that any attempt to grow the long staple in a rainy province like Assam would result in failure and would in any case bring our people into competition with the American growers, while now they have almost a monopoly. One Government officer objected to the altered date of our agricultural show at Shillong on the ground that we should lose flowers and vegetables and, though the time suited potatoes and maize better, these articles were neither beautiful nor interesting. The criterion is whether they pay: it does not matter much about their artistic qualities.

Our duty is to increase, if we can, the income of the cultivator: in a manufacturing centre the proprietor of a factory would not abandon making shoddy articles which gave him a profit of 15 per cent. for the problematical advantage of turning out artistic goods which would bring him even as much profit. So in agriculture the object in view is profit; the material bringing the profit is a detail. We find certain crops which have been grown in Assam for hundreds of years and have adapted themselves to local conditions of climate and soil: without entirely disparaging the introduction of exotics, it is surely our first duty to try to improve what we find. Taking the plains districts, we find 76 per cent. of the cropped area under rice, 6 per cent. under tea, 5 per cent. under oil-seeds, 2 per cent. under jute and 1 per cent. under sugarcane, leaving 10 per cent. for all other crops, including house gardens. It is obvious from these figures that the improvement of the paddy crop should occupy a good deal of our attention and our two District Agricultural Officers are paying special attention to this. The extension of jute cultivation is being pressed by the merchants of Calcutta, and there is no doubt that it is a most paying crop to the cultivator. At Jorhat a great deal of knowledge has been acquired with regard to soils and the cultivation of sugarcane: the achievements under the former head should be of great use to the tea industry as well as to cultivators of high land, while what we have learned of cane should, on the present indications, introduce a new industry to this province, which should be a great source of wealth. These investigations will go on, but we still have our main crop, rice, untouched, and we have done nothing to encourage jute. These two crops were taken in hand at the Dacca Farm during the existence of Eastern Bengal and Assam, and it is no fault of ours or of our predecessors that nothing much has been done in Assam. But the fact remains that nothing much has been done. If we cannot do a great deal in the matter of tillage, we can most probably improve the rice crop by the introduction of economical manuring and we certainly should be able to do so by seed selection. In fact, if we did nothing else than improve the seed, we should have accomplished much. I have no hesitation in offering this statement for criticism, and I have little doubt of its acceptance. Yet, quite recently, objections were raised to an experiment station in the Surma Valley on the ground that we could not do much in the way of teaching the Sylhetti to grow rice, and it was quite solemnly suggested that, if we wanted a station there, we should try to grow fruit on uncultivated *tilas* rather than disturb prescriptive rights by acquiring land for a farm. Suggestions of this kind show a complete want of appreciation of the object of any agricultural department. Why are there wheat and cotton farms in the Central Provinces and Bombay and the Punjab? In fact why have an agricultural staff at all? We are not a showy Department and results are slow in coming: educated people live too fast now-a-days to wait for us. But the appreciation expressed by these members of the planting community who have visited Jorhat of the work of Messrs. Meggitt and Birt and the absolute certainty, in the opinion of those who ought to know, of successful competition in India of Assam with Java in sugar, if only capital is forthcoming, are a complete reputation of the scoffers.

I have written strongly on this point, because I feel strongly that our officers have done very useful work and, in spite of occasional ill-informed criticism, are strenuously endeavouring to continue doing so. I hope that my remarks will not be taken in ill part by anyone: they were written with the object of asking for a little consideration of the facts as they exist, a little common sense, and at least an allowance

of the possibility that the Agricultural Department is not manned by visionaries and of the facts that the Department is young and that it takes time to move the farmers of any country and much longer than usual to rouse the raiyat of this province.

Notice of services.

45. I cannot speak too highly of the work done by Mr. Birt, Deputy Director of Agriculture, and Mr. Meggitt, Agricultural Chemist, Bengal: we are very fortunate in securing the services of the latter for Assam. Both these officers are brothers in keenness, grasp of local conditions, methods of work and co-operation. The latter is more important than it seems at first sight: serious differences have arisen in places owing to the expert in one subject insisting on its superiority to all others: here both officers are almost self-sacrificing in mutual help. I am very grateful to them for the energy and, at times, patience shown by them in dealing with the problems submitted to them: I could not wish for two better advisers and assistants.

M. Fazlal Haq Ahmed has been appointed Agricultural Supervisor too recently for me to comment on his work, but he promised well under training and I hope he will be as satisfactory in his present post.

U Herrick Singh, the Khasi Farm Superintendent at Upper Shillong, is the best man of his grade, and the Chief Commissioner was pleased during the year to put him on the regular scale of pay: he has all the Khasi grasp of practical work. U Harry Singh continued to do good work as Overseer in charge of demonstrations in the Khasi Hills. Srijut Binaram Das at Jorhat is occasionally afflicted with the procrastinating tendencies of those born in the Upper Brahmaputra Valley. Babu Rukmini Mohan De has only recently been appointed to the charge of the Farm in the Surma Valley, but promises well.

The two District Agricultural Officers, Babus Binod Bihari Das and Satyendra Chandra Dutta are doing good work so far.

My best thanks are due to the office staff, and more especially to Babu Raj Kumar Nandi, Head Assistant, who has long been associated with the Agricultural Department.

Co-operative Societies and Agriculture.

46. I have been driven to the conclusion that Mr. S. G. Hart's proposal that co-operative societies should be placed in Assam under the Agriculture Department was very sound. We continually find agricultural needs which could easily be supplied by co-operation, and we bring them to the notice of the Registrar, but I am sure that much more could be done if one and the same officer was in charge of both branches. I was first inclined to suggest that the officer holding my post should be also appointed as Registrar of Co-operative Societies and should in return be relieved of all trade statistics (*not* agricultural statistics), the compilation of which could be made by the Inspector General of Registration or indeed any other officer. I think, however, that the burden would be too heavy, and I understand, moreover, that it is not improbable that a whole-time officer will be appointed Registrar of Co-operative Societies. If so, I would suggest that he be placed on the same standing as the Superintendent, Veterinary Department, and be subordinate to the control of the Director of Land Records and Agriculture, who should be relieved of the compilation of trade statistics. I presume that the Registrar will be a young officer, if a Civilian, and will require some control, while, if he is to be an Indian officer, I am sure that he would be glad of the support of the head of a larger department.

Land Records should not be separated from Agriculture: the latter should always be under an officer who has been on settlement work and consequently has gained an intimate acquaintance with agricultural conditions.

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

Report on the work done by the Agricultural Chemist to the Government of Bengal in Assam during the year ending June 30th 1913.

1. *Tours.*—I spent some 190 days in Assam on tour during the year, visiting Jorhat 5 times, Shillong once, Itakhola once, and making a ten days' tour in Kamrup in connection with the proposed sugarcane experiments there.

The main items of work which have occupied my attention during the year may be put under four heads :—

1 Sugarcane work.

2. Soil investigations, involving experimental field work and Laboratory studies also.

3. Green-manuring problems.

4. Special work, *e.g.*, preliminary work on Kamrup soils ; an examination of the Jorhat Distillery Effluent ; preparation of plans for the new Jorhat Laboratory and making arrangements for its equipment.

2. *Sugarcane.*—This work again took almost my whole-time attention for some three months of the year.

It involved the chemical control of all the experimental cane work going on at Jorhat. The results will be found in the current report of that Farm.

Two West Indian canes of great merit have been acclimatised and are being distributed. These varieties easily yield from 25 to over 30 tons of cane per acre, giving a juice containing from 16 to 18 per cent. cane sugar, having a very desirably low glucose ratio, and a very high coefficient of purity. The juice easily defecates, and is on all counts admirably suitable for the economical production of white sugar under a Central Factory system.

Mention was made last year of a recrudescence of disease in one or two varieties, particularly striped Mauritus, and of the methods taken to combat it. These measures briefly included greater attention to drainage, rigorous selection of planting material, and the burning of cane trash on the field immediately after harvest.

The results have been extremely satisfactory ; the incidence of disease is already enormously reduced, damage to the cane by moth borer last year was very much less, and the cane generally was much finer than we have had heretofore.

A slight change in manurial policy, whereby the manure was used entirely in the rows instead of being spread broadcast as heretofore, no doubt had an influence on the yield of cane.

The desirable fact remains that the cane has never yielded such crops before.

The average yields of cane, and sugar in expressed juice for three best varieties, each grown on duplicate ¼ acre plots, during the year were as follows :—

Cane 71,500 lbs. = 31·9 tons per acre.

Pure cane sugar in expressed juice 8,110 lbs = 3·62 tons per acre. Purity of juice over 90 per cent.

A modern efficient Central Factory would recover at least 10 to 15 per cent. more juice than we can, so that at a moderate estimate an outturn of 3½ tons per acre finished sugar should be possible.

It is very instructive to recall that only four years ago, when the cane was grown on the same land as produced such large crops this year, the average yield of the same varieties was only about 10 to 12 tons per acre, despite the fact that it received a much heavier dressing of manure that year.

Within the course of 4 years then, the crop has been more than doubled, and though acclimatisation has played some part in this, undoubtedly the evident and enormous improvement in soil conditions brought about by a preliminary dressing of lime through cultivation and a sound rotation which includes green manuring, must be held to be chiefly responsible.

It is matter for congratulation when increased crop production is also attended by improved soil conditions, rather than by a process of gradual soil impoverishment, and the former is undoubtedly the case at Jorhat.

In addition to the testing of varieties, work on planting methods was extended and a manurial experiment commenced during the year. In our efforts to obtain big yields of high quality cane there can be no doubt that there exists a very close mutual relationship between these three problems of planting methods, manuring and the rotation of crops, while for cultivation on a large scale for Central Factory work, such as we are aiming at in Assam, the extensive nature of the tillage operations required must also be considered in relation to the above.

Rotation.—A rotation of the two years cane, followed by *aus* paddy and *matikalai* in the third, with a green crop of cowpeas in the fourth year preparatory to cane again, has proved very successful, and the effect on the soil and the cane of the inclusion of cowpeas as green manure has been especially marked and beneficial, deepening and enriching the soil and increasing the outturn of cane.

Planting methods.—The planting experiments during the year tend to show that wider planting between rows increases the tillering power of the cane, and that having regard to yield and quality for high class thick canes in Assam the optimum number of sets per acre is of the order of 7,000 to 8,000. This work was extended during the year.

Manurial work.—Manurial experiments in relation to the phosphatic requirements of cane on these soils and in regard to the relative value of cowdung and oilcake, were commenced during the year under review.

Moth Borer.—To minimise the attacks of moth borer, the experiment of burning the trash *in situ* on the cane field after harvest was tried last year, and whether the result is to be wholly ascribed to this or not, the fact remains that the incidence of attack by borer was very much reduced this year and the tillering power of the canes was much improved. This practice will be continued.

When it is pointed out that a bad attack of borer may mean a loss of 1,000 lbs. sugar per acre, the importance of combating it may be realised.

Selection.—Car ful selection of planting material on the lines followed in the previous year with such success was made.

Early direct planting.—The usual practice in Assam is to plant in nurseries with the early spring showers, and afterwards to transplant to the field in April or May. This is troublesome, and impossible when large areas are to be planted. The experiment was tried this year of early planting direct into the field Planting was done in the middle of February, and very little rain fell for a month afterwards. Despite this fact, and some loss by white ants in consequence, the cane did well, yielding almost exactly the same weight of crop as a neighbouring plot of the same variety which was transferred from the nursery in the ordinary way in April.

It is quite probable that for certain varieties early direct planting is quite feasible.

The use of ratoon tops for planting.—The possibility of being able to make use of ratoon tops for planting is a matter of very great economic importance in any large scheme of cane work, one reason being that the time of ratoon cane harvest coincides more nearly with the planting season than does plant cane harvest.

The experiment was made during the year of planting an area with ratoon tops of B.147 cane.

The crop was excellent in every way, and quite equal to the best crops we have ever had with this variety using plant cane tops.

Soil investigations.—The work undertaken during the year may be put under the following heads:—

(*a*) Continuation of field and laboratory work in connection with the permanent manurial and rotation experiments at Jorhat.

(*b*) The initiation of field experiments in the use of finely ground raw mineral phospat s as a substitute for more expensive sources of phosphoric acid. Laboratory work in this connection was also undertaken.

(*c*) Experiments in regard to the use of finely ground limestone as a substitute for burnt lime, especially for light soils and where organic matter is very deficient.

(*d*) Field work designed to elucidate the reasons underlying the remarkable action of lime at Jorhat.

The above forms part of a general investigation of special soil conditions obtaining in tracts of heavy rainfall where a dangerous degree of soil acidity is fairly widespread. Much valuable information has already been obtained as to the special characteristics of these soils, and the measures adopted for their amelioration are proving very promising.

The work is being tackled principally from the point of view of the soil's requirements for lime, phosphoric acid and organic matter, for general cropping, and involves a study of the principles underlying their most successful and economical use and supply.

Of special importance under our conditions is the form in which certain measures find their most suitable application.

Thus work during the year has shown that the use of basic insoluble phosphat s is generally attended by markedly beneficial results on cropping, while where phosphoric acid is applied as acid superphosphate the effect is extremely small, unless used in conjunction with lime. There is good reason to believe that its continued use without lime can result in nothing but definite injury to the soil.

Again, sulphate of ammonia proved absolutely toxic to a crop of oats in the cold weather in the absence of previous liming.

Permanent manurial and rotation experiments, Jorhat.—This formed the second year of these experiments. At Jorhat the early action of lime alone is too strongly marked as to minimise the apparent effects of other applied manures in the case of many crops.

The cropping during the year was *jowar* in the rains and mustard in the cold weather.

The effect of lime on *jowar* becomes greater with increasing dressings, no crop at all being produced in its entire absence ; while in the case of mustard the smaller lime applications were almost as affective as the larger ones, full crops maturing only when cross-dressed with bonemeal.

Even in the case of mustard, however the use of bonemeal without any lime resulted in no crop whatsoever.

It is significant to note that at Jorhat, of four different crops tried, the plots receiving no lime, even when cross-dressed with bones and cowdung, have produced no crops barring *aus* paddy since the experiment was commenced. The three crops, oats, *jowar* and mustard, have all provided the most convincing evidence of the great value of lime on this soil.

The effect of the pre imary green manuring with cowpeas of one of the blocks was again clearly marked on the second year's cropping, and goes to strengthen our evidence that in cowpeas we have probably the finest green manure crop in the world for these soils and under the climatic conditions obtaining.

The addition of cowdung to parts of the variously limed sections in all cases yielded a fair increase in crop. One other point which it is desired to make concerns the relative efficiency of a single large versus repeated smaller dressings of lime, but the experiments are too young as yet to give any definite pronouncement.

Despite the high cost of lime in Assam, the moderate lime dressings are showing fair profits, especially where green manuring is included in the rotation. Further details in regard to these experiments will be found in the current report of the Jorhat Farm.

New field work.—The success which has attended the above experiments in certain directions led to various new lines of work during the year including :—

(*a*) *The testing of raw finely ground mineral phosphates as substitutes for the more expensive sources of phosphoric acid.*—Laboratory tests are being made and field work was commenced during the year on different crops and under various conditions.

Indications already obtained point to these mineral phosphates as likely to form a very economical source of phosphoric acid, especially where their use is combined with green manuring under the soil and climatic conditions prevailing in Assam. In an experiment on oats in the cold weather, and cowpeas in the rains, raw phosphate had a very pronounced effect indeed. Besides containing some 25 to 30 per cent. of phosphoric acid, some of these phosphates contain up to 30 per cent. or so of carbonate of lime, which has the effect of increasing their efficacy on sour soils.

(*b*) *Field experiments in regard to the use of finely powdered limestone as a substitute for burnt lime especially on light soils and where organic matter is deficient.*—There are many *a priori* reasons why ground limestone should exercise the same beneficial effects as burnt lime and why its use would be preferable in many instances.

Further information on these points will be found in the appendix to the current Jorhat farm report. Results obtained this year show that it acts qualitatively like burnt lime, but is slower in action. In a province where its use would appear to be brought with such enormous possibilities, it is a pity that it can hardly be obtained, and then only at an excessive cost.

The opening out of the at-present unexploited deposits in Assam would appear to offer the solution of this difficulty.

The demand seems likely to increase rapidly, and co-operation amongst users should succeed in reducing the present excessive cost to a reasonable figure, not exceeding annas 8 per maund delivered at river ghats in Assam or at nearest Railway station.

(*c*) *Field work designed to elucidate the reasons underlying remarkable action of lime at Jorhat.*—A comprehensive experiment was commenced during the year with a view to ascertaining, if possible, to what particular function of lime its observed early remarkably beneficial action on cropping may be due.

Lime might conceivably benefit cropping in a number of ways, *i.e.*, by supplying plant food, by improving the texture and the general biological conditions, or by liberating other plant foods from the soil reserves, etc., but though some of these desirable effects may follow the application of lime very quickly, the results of this experiment go to prove most convincingly that its early beneficial action on cropping is undoubtedly primarily due to its power of neutralising soil acids (some of which are highly toxic), leading to an immediate improvement in the soil bio-chemical factory. Clearly the correction of acidity forms the very corner stone of any attempt at establishing better general soil conditions for most cultivated crops, and a knowledge as to the presence or absence of soil acidity becomes of fundamental importance in the framing of manurial schemes ; our experiments showed clearly that in the presence of acidity not only did certain manures and combinations of manures have no effect on the crop, but that they did very definite harm in some cases. With previous liming, using the same manures, the whole position was reversed, resulting in increase of crop. An account, with the whole of the interesting results of this experiment, will be published shortly.

Laboratory work in connection with field experiments.—Work was taken in hand during the year in regard to the role of lime and manures used in the field, and their mutual interdependence for the best results in practice.

It was attempted to obtain information on the following points :—

(*a*) The extent and depth to which the varying lime dressings have neutralised the soil acidity.

(*b*) The physical effect on the soil.

(*c*) The immediate chemical role of applied lime.

(*d*) The effect of lime on the availability of applied phosphate.

(*e*) The relative loss of lime which may early follow the use of small as against large single applications.

In regard to some of the above, present indications cannot be insisted on, as longer time will be necessary to effect much change in certain directions. Up to date I have found that the neutralising effect of lime dressings is not exerted to any appreciable extent below the depth to which it is mixed with the soil during cultivation, but that the physical effect of the descending bicarbonate of lime is marked to a much lower level.

These facts have a very evident bearing on the practice of liming.

Again though the larger initial dressings of lime, 1 or 2 tons per acre, cause a very slight temporary increase in the amount of carbonate of lime in the cultivated layer, it is very fugitive, so that some 12 months after application no increase could be detected in these plots over that in the non-limed soils. By this time also, the 1 ton lime plots had in both cases again become very slightly acid, the 2 ton plots remaining faintly alkaline to 6 inches depth.

These facts shed some light as to the amount of lime that will be required to provide even a small working reserve of carbonate of lime in the soil, a very desirable thing in a region of permanently acidifying conditions.

Further examinations showed that the added lime had combined with the acid organic matter of the soil, neutralising and fixing it, and giving rise to desirable lime compounds.

In the result, whereas the unlimed soil gives a dark coloured liquor when shaken with dilute ammonia after liming, it only does so after a preliminary acid digestion.

The improved cropping power of the soil which accompanies this change in the condition of the organic matter points to this simple test as a reliable auxiliary in deciding the necessity for liming and, what is a safe amount to apply.

Considered in relation to improved cropping capacity, laboratory tests of the variously limed plots go to show that while most of the crops grown do best when the surface soil acidity is fully neutralised in the case of *aus* paddy, acidity as commonly met with, seems to have no ill effects.

As regards the effect of lime on the availability of applied insoluble phosphates, the Jorhat soils have not yet been examined, but work on the similar plots at Dacca goes to show that the availability, as measured by solubility in weak acid solvents, increases with the larger lime dressings.

With reference to the early loss of lime to the surface soil which may accrue in applying large single doses, the results obtained undoubtedly indicate that such loss is greater the larger the application. This might be expected especially if heavy rain early follows the spreading of the lime, and is one argument in favour of the use of smaller recurring doses.

A special line of enquiry has shown that the Jorhat soil contains a definitely toxic compound; the unlimed soil is particularly toxic to *Jowar* in the rains and many crops in the cold weather.

This substance has been isolated and experimented with in very dilute culture solution using seedling plants. Observations thus made agree well with field results; this substance while very toxic to *Jowar* is not so to *amon* paddy, which on the contrary appears rather to flourish in its presence. The toxicity to *Jowar* seedlings in culture solution is very largely minimised by the addition of very small amounts of lime, or a complete nutrient solution, to the culture. The most marked effect to this toxin is on the young roots; their growth is at once stopped, the root becomes discoloured, generally hooks round and sometimes swells up at the end, the plants succumbing in a short time, while those in control water culture are still alive and growing.

The toxin has been crystallised but not in sufficiently large quantities as yet for positive identification.

3. *Green manure work.*—During the year several crops were under test at Jorhat for green manuring purposes, *e.g.*, *dhaincha sunn hemp*, Manchurian soy beans, and cowpeas.

The amounts of green vegetable matter, organic matter and nitrogen per acre for both tops and roots have been determinded for three of the above crops, and in some cases these determinations were made for the same crop at different stages of its development. All these crops made extraordinary good growth on limed land, not so good on unlimed areas.

Cowpeas.—(Vigna catiang) is the crop which has been used mostly for green manuring at Jorhat, forming a regular feature of the rotation there practised. Within the last six years, it has wrought an enormous improvement in the soil, which has been clearly reflected in crop yields.

In our experience it forms the most generally useful and applicable green crop. Though doing best on loamy soils, it makes fairly heavy crops on stiff land. Sown thickly (25 to 30 seers per acre) broadcast on land in fair condition cowpeas, within two months, produce a dense smothering crop, choking weed growth, while the soil surface becomes covered with a mulch of decaying fallen leaves.

Except at a very early stage when all are succulent, the proportion of soft succulent easily decomposable vegetation to the whole crop is very much greater in the case of cowpea than with most other green manure crops.

It decays very rapidly in the soil, a few weeks being ample if the soil is moist to remove every trace of even a heavy crop.

When the crop is some five or six weeks old it begins to form trailing vines, but usually not before that age. In consequence it is impossible to turn a mature crop in with the plough, it is easily put under the *kodali*.

Cowpea has a wide growing season in Assam and may be sown any time after the early spring rains until August with the certainty of getting a crop. Late sown crops should be seeded down thickly.

As a catch crop cowpea is invaluable; at Jorhat this year cowpea was grown as a catch green manure between harvesting *aus* paddy and sowing of cold weather crops. Using an early ripening *aus* paddy, an eight to ten anna crop of cowpea can be got in this way.

Experience has shown that sometime must elapse between turning in a green crop and sowing the *rabi* crops, so that when *rabi* crops are to follow, the green manure must be turned in; certainly not later than the middle of September, and earlier than this is still better. Owing to the long sowing season, the rapid growth of the crop, and the relatively large amount of easily decomposable vegetation produced, as also its usefulness as a catch crop, the cowpea is certainly the most useful green crop tried by us and capable of a much wider application than the others.

A full crop at Jorhat give some 7 tons green vegetable matter (containing 0·5 per cent. nitrogen), some 80 lbs. nitrogen and 1½ tons dry organic matter per acre.

Dhaincha and *sunn hemp* also made very good crops on limed land. If sown in good time and plughed in before the crop becomes woody, both make good green manure crops, producing large amounts of green matter and nitrogen per acre, and decaying quickly if turned under when some 3 to 4 feet high. If allowed to get woody, the nitrogen percentage falls and the crops decay very slowly, so that immediately succeeding crops are often not benifitted, sometimes the reverse, the effect however becoming apparent in later cropping.

Dhaincha has a stronger root system than *sunn* hemp and thus better suited for opening out stiff sub-soils.

Sunn hemp does better on lighter soils, but not so well as *dhaincha* on stiff damp land. There would appear to be a useful sphere for *sunn* hemp as a green manure on lighter types of soil in the Assam Valley.

A thick crop of *dhaincha* or *sunn* hemp, 3 to 4 feet high, will supply upwards of 6 tons of green matter, 60 to 70 lbs. nitrogen and rather more than a ton of dry organic matter per acre.

Manchurian Soybeans were grown as a green crop during the rains; they made luxuriant growth on limed land, not so good on unlimed. On account of its excellent growth the crop was left for seed.

From the limed land some 1,500 lbs. seed per acre was obtained, only about quarter that amount resulting from the unlimed area. This gives some idea of the relative growth of the crop in either case

4. *Special work.*—This included:—

(*a*) Some preliminary work on Kamrup soils. A series of soil sample was taken for moisture determinations and general examination from the tract in which the sugarcane experiment is to be made.

This work is still in hand.

(*b*) An examination of the Jorhat Distillery effluent at the request of the Public Works Department, Assam.

A report on this has already been submitted.

(*c*) Preparation of plans for the Jorhat Laboratory and making necessary arrangements for the fittings and equipment thereof.

A. A. MEGGITT,

Agricultural Chemist to the Government of Bengal, Dacca.

APPENDIX II.

List of Honorary Correspondents of the Department of Agriculture in Assam (the names of correspondents who are also Associates are marked*).

SYLHET.

1. D. Ferguson, Esq., Dhamai tea estate, post office Dakhinbag.
2. Babu Girija Nath Biswas, post office Baniachang.
3. „ Hara Kishore Gupta, post office Pail, Habiganj.
4. „ Satish Chandra Deb, B.L., Karimganj.
5. „ Pavitra Nath Das, post office Beani Bazar.
6. „ Amar Nath Roy, B.A., Sunamganj.
7. „ Ambika Charan Bhattacharji, post office Lauta.
8. „ Basanta Kumar Nandi, post office Itakhola, Assam-Bengal Railway.
9. „ Bidya Kumar Chawdhuri, Sunamganj.
10. „ Baisnab Charan De, post office Kaliganj Bazar.
11. Maulvi A. M. Chowdhury, Zemindar, Kanihati, post office Hazipur, South Sylhet.
12. Babu Saroda Charan Chakravarty, B.A., Deputy Inspector of Schools, Habiganj.

KHASI AND JAINTIA HILLS.

13. U Job Solomon, Shillong.
14. „ Kubur Sing, Mylliem.
15. „ Bordhan Ray Kanti, Mahadeb, Cherrapunji.

GOALPARA.

16. Babu Dijesh Chandra Chakrabarti, Manager, Gauripore estate.
17. „ Lalit Mohan Dutta, Dhubri.

KAMRUP.

18. Rai Saheb Chidananda Chaudhury, Gauhati.
19.* Babu Mahendra Mohan Lahiri, Gauhati.
20. Munshi Tayab Ali, Sonapur, Kamrup.

DARRANG.

21. Babu Jatindra Chandra Maitra, Tezpur.

NOWGONG.

22. Babu Jnan Chandra Ray, Baithulongso, post office Kampur.

SIBSAGAR.

23.* Babu Akshoy Kumar Ghose, Sibsagar.
24.* Srijut Debeswar Gossain, Barpathar, Sugarcane Farm, post office Badlipar (Golaghat).
25. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.

APPENDIX III.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1913.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(a) Sale of manure and farm produce ...	4,659 10 0	(1) Superintendence	16,329 12 6
(b) Other receipts	1,745 9 0	(2) Agricultural Instruction ...	2,248 0 2
(c) Receipts from seed depôt ...	89 4 6	(3) Agricultural Chemist ...	8,334 13 0
		(4) Jorhat Farm	10,784 7 5
		(5) Upper Shillong Farm	22,349 10 2
		(6) Shillong Station Nursery ...	310 7 9
		(7) LaChaumiere Experiment Station ...	15,633 14 1
		(8) Sericultural experiment at Shillong	674 15 6
		(9) Sylhet Farm	150 0 0
		(10) Terraced rice cultivation in Naga Hills.	265 9 5
		(11) Agricultural Demonstration in Lushai Hills.	1,000 0 0
		(12) Other demonstrations	8,388 6 6
		(13) Sheep and Goat breeding operations	1,236 9 6
		(14) Poultry breeding operations ...	1,670 15 6
Total receipts ...	6,494 7 6	Total expenditure ...	89,427 9 6

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 6493R., dated the 3rd December 1913.

READ—

The Report of the Department of Agriculture, Assam, for the year ending 30th June 1913.

RESOLUTION.

THE staff of the Provincial Agricultural Department is beginning to take shape. The appointment of an Agricultural Chemist has been sanctioned by the Secretary of State, and Mr. A. A. Meggitt, B.SC., is expected to join the post in January. An Agricultural Supervisor and two probationary District Agricultural officers were appointed from 1st June 1913. Mr. McSwiney has recorded his opinion that the subordination of the District Agricultural officers to the District Officer is a mistake. The scheme is an experimental one and Mr. McSwiney's views will be given full consideration when a report as to its working is submitted to the Government of India in June next. The post of an Entomological Assistant has recently been sanctioned by the Chief Commissioner. Proposals have also been approved which will increase the number of trained demonstrators available for district work.

2. For the scientific training of students in agriculture, this province is dependent upon the courtesy of Bihar and Orissa in admitting students from Assam to the Sabour Agricultural College. The Chief Commissioner has sanctioned the grant of one scholarship of Rs. 20 a month tenable at that College for three years. Sir Archdale Earle much regrets to hear that during the year under report two successive candidates for the scholarship left the College owing to a distaste for the manual labour which is inseparable from a practical education in agriculture.

3. The Chief Commissioner congratulates the Department on the interesting and valuable results obtained, with special reference to sugar-cane, from the experiments in soil improvement, planting, and crop-rotation, at the Jorhat Experimental Farm. He agrees with Mr. McSwiney as to the great importance of the early establishment of the farm in the Surma Valley, where investigations may be undertaken in connection with rice and jute, and hopes that work will be started on this farm during the current year. The new Experimental Fruit Farm at Shillong has made a most promising start under the able management of Mr. C. H. Holder. His report of the 29th June 1913 has been reprinted as an annexure to this Resolution.

4. The important work of popularising wet rice cultivation as a substitute for *jhuming* continues to make slow but steady progress in the Lushai and Naga Hills.

5. Attempt to popularise the use of the iron roller crushing mill for sugar-cane and the bordeaux spraying mixture as a preventive of the potato disease in the Khasi and Jaintia Hills are reported to have been impeded by the lack of the capital required for the initial outlay. The Chief Commissioner is inclined to agree with Mr. McSwiney that a closer connection between the Agricultural Department and the Registrar of Co-operative Societies is desirable, and the point will be thoroughly considered in connection with the altered arrangements for the control of Co-operative Societies which are contemplated.

6. The Chief Commissioner has observed with much pleasure the excellent work performed by Mr. Birt, Deputy Director of Agriculture, and by Mr. Meggitt, Agricultural Chemist, Bengal. He desires to place on record the indebtedness of the Local Administration to Mr. McSwiney for the energy and ability with which he has guided the initial stages of the new Agricultural Department. The interesting and thoughtful report which Mr. McSwiney has submitted speaks for itself. Sir Archdale Earle is also glad to learn that the other members of the Department are shaping well. He has but little doubt that the Agricultural Department of Assam will be a most competent and useful one in the very near future.

ORDERED—That a copy of this Resolution and of the report be published in the Gazette for general information.

By order of the Chief Commissioner of Assam,

A. W. BOTHAM,

Second Secretary to the Chief Commissioner of Assam.

REPORT OF THE FRUIT EXPERIMENT STATION, SHILLONG, FOR THE YEAR ENDING ON THE 30TH JUNE 1913.

Introductory.

1. Land of the unclassed State forest situated on the south side of the Jowai road was selected in July 1912 for the site of the fruit garden. Its elevation is about 5,100 feet, distant about a mile from the town. It comprises an area of 35·6 acres, of which 15 to 20 acres is suitable for fruit planting. Work commenced in October 1912. A block of 5 acres of the forest on the lowest level was selected for the first year's planting and has been fenced with Page's wire fencing. Of this area, the soil on about 3½ acres was found of suitable nature for planting. The soil varies from light sandy loam lying above stone to a heavier loam of good depth. The varieties planted were selected to, as far as possible, suit the soil they were to be planted in, but some may have to be transplanted if they do not thrive in their present position. Virgin soil in a pine forest would doubtless benefit by being left exposed for some time after clearing before planting, but the deep trenching done and application of lime greatly improved it. The young trees are healthy and are beginning to put on a good growth. Atmosphere has as much to do with the results as has the soil, and success cannot be looked for in Shillong until it is known what varieties will thrive. An experimental planted area of 10 acres will be necessary for this purpose. Insects, blights and the diseases fruit trees are attacked with, can be contended with. From the 5 years' experience of fruit growing I have had in Shillong, I consider that rabbits, birds, wasps and similar pests that other countries have to contend against, would give as much trouble as do the beetles and flies, the chief enemies of fruit trees in Shillong. Blights and diseases are no worse than in other countries, and if fought against from the commencement by spraying can be overcome. Certain properties where wanted will have to be added to the soil. The experiments made with Superphosphate of Lime, Sulphate of Potash and Sulphate of Ammonia will be carefully watched. The fruit trees were purchased from Messrs. Thomas Rivers & Sons, Sawbridgeworth, Herts, and Messrs. Stuart Low & Company, Bush Hill Park, Middlesex. Messrs. Rivers' first consignment was despatched on the 12th November 1912 and arrived at Shillong on the 21st January 1913. There was delay in getting delivery at the docks in Calcutta. The pear, cherry and peach trees suffered most, and in consequence have been considerably set back—98 per cent. of the trees have recovered. Messrs. Stuart Low & Company's consignment despatched on the 19th December 1912 arrived in very good condition on the 8th February 1913. A second small consignment from Messrs. Rivers despatched 26th February 1913 arrived on the 1st May 1913; the delay of a week at the London Docks unfortunately gave a severe check to the trees. Six cherry and six peach trees arrived dead; the majority of the rest of the trees survived and have been planted out. Planting commenced on the 27th January 1913, and was finished on the 8th May 1913. The bush and pyramid trees have been planted 15ft. × 15ft. diagonally, the upright trained trees 7ft. apart and the single cordon trees 2ft. apart at an angle of 60°. The standard and horizontal trained apple trees and the orange and lemon trees have been planted in suitable situations.

Varieties planted.

2. The following statement shows the number and varieties of fruit trees planted.

Species of Fruit trees.	Variety.	Whence obtained.		Total number.	Description.
		Messrs. Thomas Rivers & Sons, Herts.	Messrs. Stuart Low & Co., Middlesex.		
Apple trees ...	Lady Sudeley ...	6	...	6	Bush.
Ditto ...	Bismarck	6	...	6	Ditto.
Ditto ...	Sturmer Pippin ...	5	4	9	Ditto.
Ditto ...	Warners King ...	12	...	12	Ditto.
Ditto ...	Potts Seedlings ...	6	4	10	Ditto.
Ditto ...	Allriston	6	4	10	Ditto.
Ditto ...	Scarlet Nonpareil ...	12	4	16	Ditto.
Ditto ...	Newton Wonder ...	6	4	10	Ditto.
Ditto ...	Norfolk Beauty ...	6	4	10	Ditto.

Species of Fruit trees.	Variety.	Whence obtained.		Total number.	Description.
		Messrs. Thomas Rivers & Sons, Herts.	Messrs. Stuart Low & Co., Middlesex.		
Apple trees ...	Lanes Prince Albert ...	6	4	10	Bush.
Ditto ...	Juneating (Red) ...	6	4	10	Ditto.
Ditto ...	Bens Red	5	4	9	Ditto.
Ditto ...	Coe's Golden Drop ...	6	...	6	Ditto.
Ditto ...	Kerry Pippin ...	6	4	10	Ditto.
Ditto ...	Golden Reinette ...	6	...	6	Ditto.
Ditto ...	Bramley's Seedlings ...	10	4	14	Ditto.
Ditto ...	Fearns Pippin ...	6	...	6	Ditto.
Ditto ...	Devonshire Quarrenden ...	12	6	18	Ditto.
Ditto ...	James Grieve ...	36	12	48	Ditto.
Ditto ...	Peasgood Nonesuch ...	6	...	6	Ditto.
Ditto ...	Yellow Ingestre ...	6	...	6	Ditto.
Ditto ...	Roundway Magnum Bonum.	6	...	6	Ditto.
Ditto ...	Grimson Bramley ...	...	5	5	Ditto.
Ditto ...	Ardcairn Russet ...	...	5	5	Ditto.
Ditto ...	Rev. W. Wilks ...	...	6	6	Ditto.
Ditto ...	William Crump ...	...	6	6	Ditto.
Ditto ...	Hounslow Wonder ...	...	6	6	Ditto.
Ditto ...	Red Victoria ...	...	10	10	Ditto.
Ditto ...	Hector Mcdonald ...	...	10	10	Ditto.
Ditto ...	Herrings Pippin ...	...	1 (Presented)	1	Ditto.
Ditto ...	Ellison Orange ...	...	1 (Presented)	1	Ditto.
Ditto ...	Charles Eyre ...	...	1 (Presented)	1	Ditto.
Ditto ...	Rymer	8	...	8	Ditto.
Ditto ...	Stirling Castle ...	5	...	5	Ditto.
Ditto ...	Northern Greening ...	9	...	9	Ditto.
Ditto ...	Scarlet Golden Pippin ...	2	...	2	Upright trained.
Ditto ...	Allington Pippin ...	2	...	2	Ditto.
Ditto ...	Beauty of Bath ...	2	...	2	Ditto.
Ditto ...	James Grieve ...	2	...	2	Ditto.
Ditto ...	Barnack Beauty ...	2	...	2	Ditto.
Ditto ...	King of the Pippins ...	2	...	2	Horizontal trained.
Ditto ...	Coxs Orange Pippin ...	1	...	1	Ditto.
Ditto ...	Kerry Pippin ...	1	...	1	Ditto.
Ditto ...	Claygate Pearmain ...	1	...	1	Ditto.
	Total	220	112	332	
Pear trees ...	Emile d' Heyst ...	10	...	10	Pyramid.
Ditto ...	Fondant Thirriot ...	10	...	10	Ditto.
Ditto ...	Madame Treyve ...	10	...	10	Ditto.
Ditto ...	St. Swithins ...	10	...	10	Ditto.
Ditto ...	Clapps Favourite ...	10	...	10	Ditto.
Ditto ...	Hessle	13	...	13	Ditto.
Ditto ...	Red October... ...	10	...	10	Ditto.
Ditto ...	Beurre d' Amanlis ...	10	...	10	Ditto.
Ditto ...	Parrot	10	...	10	Ditto.
Ditto ...	Seedling Bergamot ...	6	...	6	Ditto.
Ditto ...	Josephine de Malines ...	10	...	10	Ditto.
Ditto ...	Dr. Hogg	10	...	10	Ditto.
Ditto ...	Fertility	20	...	20	Ditto.
Ditto ...	Beacon	10	...	10	Ditto.
Ditto ...	Durondeau	6	...	6	Ditto.
Ditto ...	Beurre de Naghan ...	...	6	6	Ditto.
Ditto ...	St. Jules Guyot ...	...	6	6	Ditto.
Ditto ...	Roosevelt	...	6	6	Ditto.
Ditto ...	Blickling	...	6	6	Ditto.
Ditto ...	Santa Claus	...	6	6	Ditto.

Species of Fruit trees.	Variety.	Whence obtained.		Total number.	Description.
		Messrs. Thomas Rivers and Sons, Herts.	Messrs. Stuart Low & Co., Middlesex.		
Pear trees ...	Precoce de Juillet ...	...	6	6	Pyramid.
Ditto ...	Conference	3	...	3	Upright trained.
Ditto ...	Marie Louise d' Uccle ...	4	...	4	Ditto.
Ditto ...	Louise Bonne of Jersey ...	4	...	4	Ditto.
Ditto ...	Fondant d' Automne ...	3	...	3	Ditto.
Ditto ...	Conseiller de la Cour ...	3	...	3	Ditto.
Ditto ...	Doyenne du Comice ...	3	...	3	Ditto.
Ditto ...	Louise Bonne of Jersey ...	5	...	5	Single Cordon.
Ditto ...	Conference ...	5	...	5	Ditto.
Ditto ...	Doyenne du Comice ...	5	...	5	Ditto.
Ditto ...	Williams bon Chretien ...	5	...	5	Ditto.
Ditto ...	Marguerite Marillar ...	5	...	5	Ditto.
Ditto ...	Beurre Superfin ...	5	...	5	Ditto.
Ditto ...	Princes	5	...	5	Ditto.
Ditto ...	Beurre Diel ...	5	...	5	Ditto.
Ditto ...	Beurre Hardy ...	5	...	5	Ditto.
Ditto ...	Beurre d' Anjou ...	5	...	5	Ditto.
	Total ...	225	36	261	
Plum trees ...	Deniston's Superb Gage ...	10	...	10	Bush.
Ditto ...	Pelle de Louvain ...	6	...	6	Ditto.
Ditto ...	Cox's Emperor ...	6	...	6	Ditto.
Ditto ...	Ponds Seedling ...	6	...	6	Ditto.
Ditto ...	Belgian Purple ...	10	...	10	Ditto.
Ditto ...	Early Transparent ...	6	...	6	Ditto.
Ditto ...	Autumn Beauty ...	6	...	6	Ditto.
Ditto ...	Guthries late Gage ...	5	...	5	Ditto.
Ditto ...	Reine Claude de Bavay ...	5	...	5	Ditto.
Ditto ...	Victoria	9	...	9	Ditto.
Ditto ...	Greengage	5	...	5	Ditto.
Ditto ...	Czar	6	...	6	Ditto.
	Total ...	80	...	80	
Peach trees ...	Peregrine ...	14	...	14	Ditto.
Ditto ...	Alexander ...	11	...	11	Ditto.
Ditto ...	Duke of York ...	16	...	16	Ditto.
Ditto ...	Exquisite ...	4	...	4	Ditto.
	Total ...	45	...	45	
Cherry trees ...	Morello ...	3	...	3	Ditto.
Ditto ...	Kentish ...	24	...	24	Ditto.
Ditto ...	Bigarreau Kentish ...	6	...	6	Ditto.
Ditto ...	Gloire de France ...	6	...	6	Ditto.
Ditto ...	White Heart ...	...	6	6	Ditto.
Ditto ...	Black Heart ...	...	6	6	Ditto.
	Total ...	39	12	51	
Fig trees ...	White Marseilles ...	5	...	5	Ditto.
Ditto ...	Bourjassotte Grise ...	5	...	5	Ditto.
Ditto ...	Monaco Bianco ...	6	...	6	Ditto.
	Total ...	16	...	16	
Walnut trees ...	Dwarf Prolific (Juglans proeparturiens).	10	...	10	Trees.
Lowberries ...	.....	...	6	6	Berries.

Species of Fruit trees.	Variety.	Whence obtained.		Total number.	Description.
		Messrs. Thomas Rivers and Sons, Herts.	Messrs. Stuart Low & Co, Middlesex.		
Phenomenal ...	.....	...	1	1	Berries.
Loganberries ...	.....	...	1	1	Ditto.
Orange trees ...	St. Michael's Tangierin ...	6	...	6	Trees.
Ditto ...	Jaffa	3	...	3	Ditto.
Ditto ...	Malta Blood... ...	2	...	2	Ditto.
Ditto ...	Silver	3	...	3	Ditto.
Ditto ...	Sustain	1	...	1	Ditto.
Ditto ...	Malta Oval	1	...	1	Ditto.
Ditto ...	Achilles	1	...	1	Ditto.
	Total ...	17	...	17	
Lemon trees ...	Imperial Lemon ...	2	...	2	Ditto.
Strawberry Plants	Givons date Prolific ...	...	...	900	Plants.
Ditto ...	Louis Gouthier ...	...	...	350	Ditto.
	Total ...	...	...	1,250	

SUMMARY OF FRUIT TREES PLANTED—1912-13.

Standard apple trees	22
Bush „ „	295
Upright trained „	10
Horizontal „ „	5
Pyramid pear trees	191
Upright trained „	20
Single cordon „	50
Plum trees	80
Peach „	45
Cherry „	51
Fig „	16
Dwarf walnut trees	10
Lowberries	6
Phenomenal	1
Loganberries	1
Orange trees	17
Lemon „	2
Strawberry plants	1,250

3. The following experiment with manures have been carried out. The quantities were applied in two dressings at an interval of 6 weeks, in a circle 4 feet wide round the trees, starting 5 inches from the stem.

Manurial experiments.

James Grieve Apples ... ... 4 rows—5 trees in each row.

Row No.	Manures per tree.
1	6 ozs. Superphosphate. 4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
2	6 „ Superphosphate 3 „ Sulphate of Ammonia.
3	4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
4	No manure.

Clapps Favourite Pear—

No. of plot.	No. of trees.	Manures per tree.
1	4	6 ozs. Superphosphate. 4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
2	3	6 „ Superphosphate. 3 „ Sulphate of Ammonia.
3	3	No manure.

Fertility Pear—

No. of plot.	No. of trees.	Manures per tree.
4	4	6 ozs. Superphosphate. 4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
5	3	6 „ Superphosphate. 4 „ Sulphate of Potash.
6	3	4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.

Madame Treyve Pear—

No. of plot.	No. of trees.	Manures per tree.
7	4	6 ozs. Superphosphate. 4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
8	3	6 „ Superphosphate. 3 „ Sulphate of Ammonia.
9	3	No manure.

Emile Heyst Pear—

No. of plot.	No. of trees.	Manures per tree.
10	4	6 ozs. Superphosphate. 4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
11	3	4 „ Sulphate of Potash. 3 „ Sulphate of Ammonia.
12	3	6 „ Superphosphate. 4 „ Sulphate of Potash.

The 29th June 1913.

C. H. HOLDER,

In charge, Fruit Experiment Station, Shillong.

Statement of expenditure of the Fruit Experiment Station, Shillong, from November 1912 *to* 30*th June* 1913.

Head of charges.	Amount.	Remarks.
	Rs. a. p.	
Allowance to Superintendent	1,250 0 0	
Establishment	481 0 5	
Petty construction	2,986 11 9	
Seeds, plants and manures	2,939 10 4	
Instruments, appliances and machinery	81 15 3	
Reclamation	70 14 0	
Chemicals insecticide	320 5 9	
Wages of labourers	7,499 2 7	
Other charges	4 2 0	
Total ...	15,633 14 1	

A. S. P. O. (R. & Agri.) No. 55—510—4-12-1913.

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

year ending the 30th June

1914.

SECRETARIAT BOMBAY 15 SEP 1914

BY

A. R. EDWARDS, Esq., B.A., I.C.S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE, ASSAM.

SHILLONG:
PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

1914.

Price 9d.] [*Price 8 annas.*

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SHILLONG:

PRINTED BY H. H. KING, PRESS SUPERINTENDENT, ASSAM.

No. IXA.—1-516 .

FRO

J. McSWINEY, Esq., M.A., I.C.S.,

DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE, ASSAM,

To

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER OF ASSAM.

Dated Shillong, the 14th September 1914.

SIR,

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1914.

I have the honour to be,

SIR,

Your most obedient Servant,

J. McSWINEY,

Director of Land Records and Agriculture, Assam.

[Prescribed maximum length 12 pages].

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

year ending the 30th June

1914.

CHAPTER I.

ADMINISTRATION.

Director.

1. Mr. McSwiney was in charge of the Department till the 2nd April, when he was relieved by me. I held charge for the remainder of the year. Mr. McSwiney spent 149 days on tour and inspected all the Agricultural Stations. He attended the meeting of the Board of Agriculture at Coimbatore in December last, and on his way back went to Pusa to see the working of the Steam Tackle; machinery of this kind will be used for cultivation in the sugarcane farm at Khagrabari. He also made special visits to Khagrabari and Karimganj in connection with the laying out of two new farms there. I was on tour for 15 days, and inspected the agricultural stations at Shillong, Khagrabari and Jorhat. The Director of Agriculture in this province is also in charge of Land Records, and while on tour necessarily devotes a large share of his time to the latter work.

Deputy Director.

2. Mr. A. G. Birt held the post of Deputy Director of Agriculture throughout the year. He was on tour for 264 days exclusive of visits to the Upper Shillong Farm, which he inspected from headquarters.

Up till April 1st he was in charge of all the experiment stations and demonstration work in the province. From that date he was relieved of the Karimganj and Shillong farms and demonstration work in the Surma Valley by Rai Bahadur B. C. Basu. A great deal of Mr. Birt's time was employed in connection with the new Agricultural Station in Sylhet and the Kamrup sugarcane experiment. He visited Jorhat 10 times, Karimganj 7 times, and the site of the Kamrup sugarcane experiment 9 times, halting for some time on each occasion.

As a member of the Board of Agriculture he attended the conference held at Coimbatore (Madras) in December, and afterwards accompanied the Director to Pusa to get information about the working of Steam Ploughing Tackle.

In August he accompanied the Director to Dacca to meet the Agricultural Adviser to the Government of India and the Imperial Agriculturist. Other tours included visits to Haflong in connection with a site for a cattle-breeding station, to the Surma Valley to inspect the land of several honorary correspondents, to Kamrup in connection with Messrs. Birkmyre's jute-growing concern and the Rangia estates, limited, to Nahorjan to inspect and report on land for a Salvation Army Colony, and to various centres in the Khasi and Jaintia Hills to inspect demonstrations and potato seed depôts.

3. Mr. A. A. Meggitt was transferred to Assam as Agricultural Chemist from the 10th January and proceeded on leave from the 5th April 1914. With the exception of a short tour to the Kamrup Sugarcane Farm, he spent the whole of his time at Jorhat and was engaged in analyses and in despatch of sugarcane to Kamrup, as well as in soil investigation work and revision of plans and estimates for construction and fittings, etc., of his laboratory.

Agricultural Chemist.

Full advantage cannot be taken of his services till his laboratory is ready for use. It is hoped that it will be so by the time he returns from leave, or shortly after.

4. Rai Bahadur Bhupal Chandra Basu was placed on special duty under this Department from the 6th June 1913, to enquire into the silk industry of Assam, and continued to be so till the end of March 1914. In connection with this enquiry he spent 177 days on tour and visited almost all the important centres of the silk industry in the Brahmaputra Valley as well as some in Bengal and Bihar. After finishing his enquiry into the silk industry on the 31st March he was again placed on special duty to help Mr. Birt, the Deputy Director. During the last three months of the year under report he was on tour for 48 days, of which 25 days were devoted to the Upper Shillong Farm, while the remaining 23 days were occupied in three separate visits to the Karimganj Farm, and a short visit to Beanibazar for the purpose of organising a Co-operative Weavers' Society.

Special Officer.

Mr. Basu was on tour for altogether 225 days during the year.

In consideration of the development of the Department since 1912 the Government of India have been asked to sanction the appointment of a second Deputy Director of Agriculture for the Province, and Mr. Basu, it is hoped, will remain attached to this Department till it is sanctioned.

5. There is no post of Botanist at present for this province, but by the courtesy of the Government of Bengal we are able to secure the services of the Bengal Botanist when required. Mr. G. P. Hector, Economic Botanist, Bengal, visited Karimganj on two occasions and gave much valuable advice regarding the paddy selection work on the farm. Mr. C. H. Holder continued to hold charge of the Experimental Fruit Station at Shillong.

Botanist; Officer in charge of Fruit Station at Shillong.

6. Maulvi Fazlal Huq Ahmed held the post of Agricultural Supervisor throughout the year. He was in general charge of all demonstration work in the Assam Valley, of the seed depôt at Gauhati, and from November until the end of the year, of the opening out of the Kamrup Sugarcane Farm. He was on tour for 288 days, of which 163 days were spent on work in connection with the Kamrup Sugarcane Farm and the remainder in inspecting demonstrations and visiting honorary associates and correspondents of the Department.

Agricultural Supervisor.

7. U Herrick Singh, Srijut Binaram Das and Babu Rukhini Mohan De continued to hold charge respectively of the farms at Shillong, Jorhat and Karimganj. Each Farm Superintendent has a fieldman clerk to assist him, and at Karimganj an Overseer has been sanctioned in addition.

Farm Superintendent and Staff.

In July last Mr. C. S. Chaston was appointed as Manager of the Sugarcane Experiment Station at Khagrabari in Kamrup.

8. Babus Binode Bihari Das and Satyendra Chandra Dutta, the two Probationary District Agricultural Officers of Sylhet and Kamrup, respectively, having completed one year's service, have submitted reports of their investigations. Since their appointment they have been mainly employed in making surveys of the agriculture of their districts and compiling reports. They have also carried out a series of demonstrations with phosphatic manures for paddy. The District Agricultural Officer of Kamrup, in addition to this, made demonstrations with iron sugarcane mills and worked for a short time in connection with the new sugarcane farm. He has also been able to get into touch with mauzadars and others interested in agricultural improvements with the result that many of these have offered active assistance in demonstration work. His report is a full and interesting one, and gives evidence of careful enquiry. The work of the other District Agricultural Officer has owing mainly to illness not been so satisfactory. As required by

District Agricultural Officers.

the Government of India, a report on these two experimental appointments has been submitted to the Local Government. Should the Government of India sanction the scheme, the existing two posts will be made permanent and appointments will be made to other districts of the province as qualified men are available.

U Harry Singh, the Overseer in charge of demonstrations in the Khasi and Jaintia Hills district, practically does the work of a District Agricultural Officer; proposals have been submitted to Government for his appointment on the same grade as a District Agricultural Officer to the post of Agricultural Inspector in the Khasi and Jaintia Hills and Garo Hills districts.

Entomological Assistant.

9. Srijut Naresh Chandra Das, a graduate of the Poona Agricultural College, having completed one year's post-graduate training in Entomology at Pusa, was appointed Entomological Assistant on probation for two years from December 1913 at a salary of Rs. 75 and Rs. 80.

His headquarters are Gauhati, where a small laboratory is being fitted up. He works under the supervision of the Deputy Director. He was on tour for 111 days, and was occupied chiefly in familiarizing himself with, and collecting information about, common insect pests of the province. He will make a special study of rice pests, and will endeavour as far as possible to organise preventive and remedial measures in case of serious outbreaks.

Fieldmen demonstrators.

10. There are altogether 4 permanent fieldmen demonstrators, of whom two are attached to Sibsagar and two to the Khasi Hills. Two of the apprentices of the Jorhat farm will finish their training in October next; and it is proposed to employ them as temporary demonstrators in the Assam Valley. It is also proposed to send one of the apprentices of the Shillong farm on completion of his training to the North-East Frontier as agricultural instructor. The Department is still without demonstrators for the Surma Valley. It is proposed to take two apprentices annually on the Karimganj farm for training as demonstrators, but it will be two years before any are qualified for the post.

Expenditure and receipts.

11. The expenditure of the Department during the agricultural year ending on the 30th June 1914 amounted to Rs. 1,61,616-14-4, and the receipts to Rs. 6,462-13-0 against Rs. 89,427-9-6 and Rs. 6,494-7-6, respectively, for the previous year. The principal heads of expenditure are shown in Appendix II. The opening of new experimental stations at Khagrabari and Karimganj and the strengthening of the staff are mainly responsible for the increased expenditure.

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study in Primary Schools.

12. Work is being carried on in similar lines to those of last year, and the remarks made in last year's report still hold good. The Education Department provides gardens and seed for primary schools, and teaches practical work in the gardens. Stress is laid on nature study, and Lower Primary Readers in use contain lessons on this and agriculture generally.

Arrangements have been made for inspection by one of the superior officers of the Agricultural Department of training of the teachers of Lower Primary schools in giving instruction in Agricultural subjects. The question of Agricultural instruction in these schools is a difficult one and progress must necessarily be gradual.

Apprentices on Government farm.

13. There are now four apprentices under training at the Jorhat farm, while the Upper Shillong and Karimganj farms and the Shillong Experimental Fruit Station each have two. In view of the needs of the Department for fieldmen demonstrators in the plains, the annual appointment of two apprentices instead of one at Jorhat and of two at the new Karimganj farm has been sanctioned. The training lasts two years and is thoroughly practical. The two Khasi apprentices on the fruit garden worked very satisfactorily; they did especially good service in connection with the planting of fruit trees. Mr. Holder observes that with training the Khasi makes a good gardener.

Sabour Agricultural College.

14. According to the principles laid down in paragraph 9 of the last report the agricultural scholarship of Rs. 20 per mensem for three years at Sabour College in Bihar has been granted to

Srijut Debi Prosad Gohain of Sibsagar, who worked on the Jorhat farm as fieldman clerk for more than a year. Three youths belonging to this province have also joined the Agricultural College as private students this year.

Post-graduate training.

15. Srijut Naresh Chandra Das was the only student under post-graduate training during the year. After the completion of his training in November he was appointed Entomological Assistant.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—AGRICULTURE.

Experiment stations.

16. In addition to the existing agricultural experiment stations at Shillong and Jorhat and the Fruit Experiment Station at Shillong two more stations were opened during the year at Karimganj in Sylhet and Khagrabari in Kamrup. The former is for experiments with rice and the latter for sugarcane experiments on a large scale with steam tackle.

Soil improvement investigations.

17. The experiments with lime, phosphate and green manure at Jorhat were continued and extended during the year. The most striking result was the quick action of ground limestone in conjunction with green manure. Full details of the experiments are given in the current report of the Jorhat Experiment Station. The Agricultural Chemist made some elaborate field experiments with the object of ascertaining the functions of lime in this soil, and the results of his observations are being published in the form of a memoir of the Department of Agriculture.

Sugarcane.

18. The variety and planting experiments were continued at Jorhat. New work included a manuring experiment with oilcake and cowdung. The exotic varieties, *viz.*, Stripped Mauritius, B. 376 and B. 147 maintained their superiority over the local varieties both for yield and quality of juice. B. 208, which at one time was far from promising on account of its susceptibility to borer, has much improved, and owing to its high quality juice is likely to rank as one of our best varieties in the near future. Three new varieties were imported this year from Barbadoes and these have been planted in a nursery for propagation. The planting experiments on the whole confirmed our previous experience that the number of sets per acre within reason does not affect the quality of the juice. On the other hand, the weight of cane per acre is increased where the larger number of sets is used. An experiment has been laid down this year with the object of ascertaining the optimum number of sets for 4 feet and 5 feet spacing of rows respectively.

In the manuring experiment where in one series of plots half the dressing of cowdung was replaced by oilcake of an equal money value, the difference in yield is well within the limits of experimental error, the cowdung plots giving an average of 7,539lbs. sugar per acre as against 7,409lbs. for the cowdung plus oilcake plots. Apparently, therefore, when cowdung is scarce, oilcake may be used as a substitute for a portion of the usual cowdung dressing.

In view of the proposed sugarcane growing experiment with steam tackle in Kamrup, an area of 23 acres of sugarcane was planted near Khagrabari in Kamrup with the object of providing planting material for next year. For this purpose over 60 tons of our three best varieties were packed in small bundles and despatched from Jorhat.

Full accounts of the sugarcane experiment at Jorhat and also of the planting in Kamrup are given in the reports of the Jorhat Experiment Station and the Kamrup Sugarcane Experiment.

Potatoes.

19. This crop has been the subject of experiment at Upper Shillong every year since the opening of the Farm in 1898. The experiments made during the year under report included trials of varieties of cut sets *versus* whole sets and of different seed rates. Of the older varieties under trial, King of Potatoes again gave the highest yield, while the next best was Magnum Bonum. Of the varieties introduced since 1909, Windsor Castle came out at the top, and excelled even the best of the older varieties. Up-to-date, British Queen and Imperator also gave very satisfactory yields. King of Potatoes and Up-to-date proved less susceptible to disease than the others.

The trial of cut *versus* whole sets showed that there was not much to choose between the two.

The experiment with the different seed rates proved that under the conditions obtaining in the Khasi Hills 12 maunds of seed per acre give the best yield.

The season (1914) proved very favourable to the potato crop. On the Upper Shillong Farm a total yield of 1,931 maunds of potatoes was obtained from an area of 11·84 acres, giving an average on them of 163 maunds to the acre. Most of this is intended to be sold as seed. There is a brisk demand and 1,911 maunds were sold during the year to potato-growers in different parts of the province, though mainly in the Khasi Hills. A full account of the potato experiments will be found in the annual report of the Upper Shillong Farm.

Rice.

20. In the new farm at Karimganj, an experiment in the line breeding of rice was, in consultation with the Economic Botanist of Bengal, initiated towards the close of the year. The object of this important experiment is to produce improved seed for distribution to the raiyats. Definite results cannot be expected for two or three years.

At Upper Shillong some experiments were laid out in the summer of 1913 to test the effect of bonemeal against flour phosphate and of transplanting of seedlings against the local method of broadcasting seed. Owing to various causes these were not a success. They are being repeated this year, but prospects are not very hopeful.

Green manure crops.

21. At Jorhat the usual practice of green manuring with cowpeas once in a four years' rotation was continued with success. This year *Dhaincha* and *Saun* are also being used on a large scale, and several varieties of Madras and American cowpeas have been sown on small plots for trial.

Fodder crops.

22. A large number of exotic fodder crops were tried at Upper Shillong in the summer of 1913, but all of them with exception of lupins, swedes and turnips were a failure. The yields obtained from these were however so small that it is very doubtful whether it will pay to grow them. Local crops, such as maize, millets and soybean, do well here and are suitable for fodder.

Other crops.

23. At Jorhat, soybeans, although resown three times, failed on account of wet weather. Groundnuts gave a fair crop, the yield on an area treated with phosphate being 1,316 lbs. per acre as against 1,062 lbs. on the non-treated area. Small plots of Buri and Cambodia cotton were sown at Jorhat. Both varieties did very badly. The crop was sown rather late and the heavy rains were unfavourable to the healthy growth of the plants.

At Upper Shillong five varieties of American maize were tried ; with the exception of one, which gave a small yield, they failed altogether.

Fruit.

24. The Fruit Experiment Station which was opened at Shillong in 1912, under the supervision of Mr. C. H. Holder, continues to make satisfactory progress. During the year a block of 12½ acres was added to it and the total area is now 47·90 acres. By the end of the year 12½ acres had been cleared and 14¼ acres planted with European fruit trees. Great progress has been made since then. A full account of the work up to the end of June is given in a separate report. The experiment promises well. The time, energy and skill which Mr. Holder devotes to the work should go a long way towards making it a success. The fruit garden at Tissama in the Naga Hills is still in its infancy.

Section II.—Agricultural Chemistry.

25. Mr. A. A. Meggitt joined his post as Agricultural Chemist, Assam, on January 10th. Previously to this he had spent some portion of his time in laboratory work at Dacca in connection with the soil investigation work at Jorhat. His laboratory being not yet ready for him, he devoted the major portion of his time after joining until he went on leave at the beginning of April to supervising the work at the Jorhat farm, making analyses of sugarcane, completing his field experiments on the lime question and writing up the results.

Section III.—Entomology.

26. An Entomological Assistant was appointed in December.

He was on tour for the greater part of his time, examining crops, making notes on insect pests found on them and instructing cultivators with regard to preventive and remedial measures.

A list of the crops examined and the pests found attacking them is given below :—

Crops.	Insect pests.
Mustard	Aphis, diamond back moth.
Sugarcane	Chilo simplex-borer.
Sword bean	Mung pod borer.
Tobacco	Aphis, prodenia, cutworms, grasshopper.
Potato	Cut worms.
Mango	Mango stem borer, fruit borer.
Orange, lemon	Monophlebous sp., bafonicers, lemon caterpillar, bugs.
Aus paddy	Majrakata, cricket, bhur, rice bug, rice hispa.
Cocoanut	Rhinoceros beetle, palm weevil.
Cabbage	Chrysomelid beetle, pumpkin beetle, diamond back moth, grasshoppers.
Jute	Jute semi looper, cricket, jute stem borer.
Arecanut	Nil.
Mulberry	Nil.
Cowpea	Chrysomelid beetle, Monolepta, signata, oliv.
Cotton	Red cotton bug, dusky cotton bug.

CHAPTER IV.

DISSEMINATION.

SECTION I.—DEMONSTRATION.

27. Demonstrations were carried out in four districts, *viz.*, the Khasi and Jaintia Hills, Sibsagar, Kamrup and Sylhet. U Harry Singh with the assistance of three demonstrators, was in charge of the work in the Khasi and Jaintia Hills. The Agricultural Supervisor, assisted by the District Agricultural Officer in Kamrup and by two demonstrators in Sibsagar, was in general charge of the work in the Assam Valley. In Sylhet the demonstrations were made by the District Agricultural Officer.

Localities.

28. Manurial demonstrations with bonemeal and flour phosphate were made at 10 centres in the Khasi and Jaintia Hills, at 10 in Sibsagar, at 8 in Kamrup and at 12 in Sylhet.

Rice.

The manures were applied at the rate of 3 maunds per acre, and the results measured against adjacent untreated plots. In the Khasi and Jaintia Hills the average of all the centres being taken, the bonemeal plots gave a gross profit of Rs. 31-8-0 per acre on an expenditure of Rs. 15, leaving a net profit of Rs. 16-8-0 per acre or over 100 per cent, while the flour phosphate gave a gross profit of Rs. 22-8-0 on an expenditure of Rs. 13-8-0, leaving a net profit of Rs. 9 or over 66 per cent.

In Sibsagar the flour phosphate gave a gross profit of Rs. 15-12-0 on an expenditure of Rs. 7-8-0 leaving a net profit of Rs. 8-4-0 per acre. The bonemeal treatment cost Rs. 9 per acre, while the value of the average increase over the untreated plots was only Rs. 7-8-0. This shows a net loss of Re. 1-8-0 per acre on the first year, but it must be remembered that the full effect of bonemeal does not appear until the second year and continues until the third, so this loss should be converted into a handsome profit in the next two years. For this reason also, in the Khasi and Jaintia Hills, where the bonemeal more than paid for itself in the first year, the increase in the second and third years will be pure profit, since no further expenditure is entailed.

In Kamrup the results were so erratic, owing partly to unevenness of soil and partly to washing out of manures by flood, that they are practically worthless.

In Sylhet the majority of the demonstrations were rendered abortive by the high flood of July 1913 which not only destroyed the standing crops, but obliterated the effect of the manures by covering the land with a thick deposit of silt. In only five places were the crops saved and some definite results obtained. In three out of

these five places, the use of bonemeal gave a clear net profit, in one the cost of the manure was barely recovered by the increase in outturn of grain, and in the remaining case, the increase in yield was insufficient to cover the cost of the manure. The use of flour phosphate showed a net profit in two and a net loss in three places.

The fields to which these manures were applied last year should give an increased yield this year. The weight per unit volume of the grain grown on manured was 12 to 14 per cent. greater than that of grain grown on unmanured plots.

Sugarcane.

29. Demonstrations of superior varieties of cane from the Jorhat Farm were made last year on many cultivators' holdings in Sibsagar district with most satisfactory results. This year these plots were ratooned, but owing to shortage of demonstrators we were unable to obtain weighment for the ratoon crops. The reports received from cultivators, however, show that the results were satisfactory. These demonstrations have already resulted in a very large demand for planting material of the superior varieties of sugarcane, and steps are being taken to meet this demand as far as possible.

Srijut Thaneswar Sarma Barthakur of Mohokuti, Sibsagar, obtained cuttings of B. 147 from the Jorhat Farm and planted them by the side of an equal area under the local variety. He kept a careful account of all expenditure and receipts with the following very satisfactory result per acre :—

	B. 147.	Local variety.
	lbs.	lbs.
Weight of cane	40,846	22,140
Juice	22,801	10,604
Gur	4,674	2,043
	Rs. a. p.	Rs.
Value of gur	288 0 0	125
Total expenditure	136 14 0	102
Net profit	151 2 0	23

Demonstrations with 3 roller iron sugarcane mills were continued during the year Nine mills were sent out in Sibsagar district and six in Kamrup. Five of these mills were sold during the year to the cultivators who had been using them. There is now a large demand for the mills from cultivators who hitherto have used only the wooden country mills, but some agency is required for distribution and for making advances to enable the cultivators to purchase them. We find that the majority of cultivators are willing to take the mills only on the instalment system, and we have the greatest difficulty in recovering the money. With its present staff and funds, which are barely sufficient to carry on the demonstration work, it is impossible for the Agricultural Department to undertake this on a large scale. It would be, I think, a useful line of work for co-operative credit societies to make advances for the purchase of mills or to buy mills and let them out on hire. A man of Kamrup recently requested us to supply him with 50 mills to let out on hire, and we have referred him to the manufacturers.

Potatoes.

30. At the request of some cultivators of Jowai in the Jaintia Hills a potato-growing demonstration was made at Jowai. From 5 maunds of potatoes planted on 4 acres only 25 maunds of tubers were harvested. The net profit worked out at Rs. 25 per acre. The result was not so good as it should have been, the reason being that owing to scarcity of cowdung the manuring was inadequate.

Arrangements for spraying the potato fields of any cultivators who might wish to have it done were again made this year, but only 9 acres were sprayed as against 22 acres last year. A small charge is made for the actual cost of labour and materials. This was a good potato year and there was very little disease ; the cultivators apparently did not think that it was worthwhile to have spraying done.

In the Lushai Hills the experimental cultivation of potatoes is reported to be making good progress. Out of 40 maunds of Naini Tal potatoes obtained from Burdwan, 6½ maunds were sown in the Hmuifang garden and the rest distributed among villagers ; about 36 seers of English seed potatoes were also planted in Hmuifang. The outturn, except in the case of the last, appears to have been fair.

The Superintendent has also tried to demonstrate that potatoes can be grown on land covered with grass and scrub jungle which the Lushais at present make no use of. With this end in view he had 10 maunds of seed potatoes planted in land of this description at a place called Durtlang, a few miles from Aijal. The results, though not entirely satisfactory, were sufficiently good to justify a repetition of the experiment, under somewhat different conditions.

In January the Superintendent received 20 maunds of potatoes from Shillong; some of these were planted at Durtlang and some sent to Lungleh subdivision. The Superintendent remarks that the demand at Aijal and Lungleh is nearly always greater than the supply, and that the price is generally about 4 annas a seer. He hopes to make the people realise that it is to their profit to meet the demand.

At Mokokchang in the Naga Hills potato cultivation has so far been fairly successful. There is a demand for seed which we shall be able to supply. Arrangements were made for a demonstrator to be sent to this district from the Khasi Hills.

The cultivation of potatoes was also taken up in a small scale in the North-East Frontier and the Political Officer reports that the yield was good.

Terrace cultivation.

31. In last year's report mention was made of an attempt to introduce terrace cultivation as a substitute for *jhuming* on the slopes of the steep gorges on the southern side of the Khasi and Jaintia Hills. The demonstration has now been going on for two seasons. A full account is included in the Report on Agricultural Experiments and Demonstrations in Assam for the current year. It is sufficient here to say that up to date the attempt has been a decided failure. Most of the crops tried have failed to grow even moderately well. The total expenditure was Rs. 185 against Rs. 7-3 receipts.

Evidently dry cultivation on terraces is out of the question in that locality. It remains to be seen whether wet rice cultivation will succeed, and arrangements are being made to try this during the current year.

In the Lushai Hills terraces were tried only in two villages and fair crops obtained. So long, however, as there is sufficient land for *jhuming*, the Lushais are not likely to go to the trouble of making terraces. The wet rice crops at Champhai and Vanlaiphai were not as good as in former years though the outturn on the whole was very fair. Those north of Kolosib were damaged by floods, and those in the east of the district by heavy rains.

In the Naga Hills the attempt to introduce terrace cultivation is almost entirely confined to Mokokchang subdivision and progress is slow. With a view to improve matters the recurring grant for the development of agriculture has been increased and an Agricultural Demonstrator has been appointed.

With a view to the introduction of terrace cultivation in the Garo Hills arrangements were made to send an Agricultural Assistant to that district. An experiment in wet rice cultivation at Rotung in the Abor country was very successful and it will be continued. Arrangements have been made to provide the Political Officer of the North-East Frontier with an Agricultural Assistant in next October.

Fruit.

32. In the Khasi and Jaintia Hills demonstrations in the grafting and budding of fruit trees were carried out in 26 villages. Six hundred and eighty-four oranges were budded and 63 pears, 9 apple, 61 peach and 13 plum grafts were made during the year. Demonstrations in fruit culture are being vigorously pushed on in the Lushai Hills. Eight thousand orange plants were distributed during the year. Three seers of orange seeds were obtained from the Khasi Hills and sown in a nursery: the seed is germinating well. Three hundred oranges were grafted on to wild lime cuttings, but owing to heavy rain after the budding the grafts did not take well and only 20 are now alive. During the year 3,500 pine-apple slips were issued to the Lushais, of these slips 3,000 are reported to be alive. Oranges and pine-apples are now on sale in the local markets during the season. One hundred cuttings of tapioca plants were distributed last year and are doing well. Some plum, peach, mango and linchi trees planted in the Sairong garden in 1910-11 are flowering this year. Ninety-six grafted fruit trees of various kinds were obtained from Calcutta and planted in the Government gardens.

Demonstrations by Honorary Correspondents.

33. Babu Jnan Chandra Roy, Honorary Correspondent of Nowgong, reports that the Bombay jute seed which he obtained last year from the Dacca seed depôt for his own use and that of his neighbours gave a crop of 500 maunds. This year he expects a crop of 1,000 maunds. A few years ago jute cultivation was unknown in his part of the country. He has also been successful in growing sugarcane.

A sugarcane experiment made by Srijut Deveswar Gohain, Honorary Correspondent, Sibsagar, was both interesting and profitable. He planted out cuttings of B. 147 and Bogapura sugarcane using oil-cake as a manure and obtaining good yields. U Job Solomon, Honorary Correspondent, Khasi Hills, planted various kinds of mahgoes, roseberries and pine-apples in his tropical fruit farm : they are reported to promise well.

U Bordhon Roy Kanti has distributed a number of coffee plants among his neighbours. He is also carrying on, with some success, the distillation of oil from lemon grass.

Babu Bharat Chandra Das, Honorary Correspondent, Cachar, owns a fruit garden in which he grows chiefly pine-apples and oranges. It contains over 11,000 fruit trees.

Maulvi Abdul Mannan Choudhury, Honorary Correspondent of Kanihati in the South Sylhet subdivision, planted and distributed for planting five maunds of potatoes from the Shillong farm. They have done well and yielded a good profit.

Srijut Narayan Barua, Honorary Correspondent, Nacachari, made two rice manuring demonstrations and also a planting experiment. In the planting experiment he obtained 3,210 lbs. paddy per acre by planting two seedlings in a bunch, 2,961 lbs. from three seedlings in a bunch and only 2,226 lbs. from 6 to 10 seedlings in a bunch which is the ordinary local practice.

SECTION II.—AID TO THE PUBLIC.

Aid in combating insect pests.

34. No reports of serious damage by insects were received during the year. There was, however the usual attack of the rice hispa in various localities in the plains. At the time there was no Entomological Assistant, but help in the form of advice was given as far as possible.

Fungus diseases.

35. There was very little potato disease this year in the Khasi Hills. Arrangements were made to send out men with spraying machines, but their services were very little required. Operations against orange blight were confined to the budding of oranges on lime and wild citrus stocks. In all 684 oranges were budded, 256 of these being on wild stocks. The disease so far has not been found on limes or wild citrus, so it is hoped that oranges budded on these stocks will prove immune. No sign of disease has appeared on the budded oranges up to date and one tree budded three years ago is now bearing healthy fruit.

Spraying with Bordeaux mixture in the *pan* gardens on the southern slopes of the Jaintia Hills as a remedy for the disease described in last year's report was continued during the year. A garden which had been abandoned owing to the disease was sprayed twice, once in May and again in December. Out of 56 vines alive in May only 42 had survived by February and most of these still showed signs of disease. Spraying was also tried in four other gardens with rather better results, but the owners report that the treated plants are not altogether free from disease although some were sprayed three times. Apparently once the disease attacks the stem, spraying will not save the plant, and therefore all such plants should be rooted up and burnt at once. By doing this and at the same time spraying periodically all slightly affected and healthy plants, we may be able to check if not get rid of the disease altogether. It is proposed to continue work on these lines.

Seed supply, etc.

36. A depôt for the supply of seeds, manures, implements, etc., was opened at Gauhati during the year. A building was rented from November at Rs. 30 per month. There are four main rooms, two of which have been fitted up as seed stores, while the other two provide offices for the Agricultural Supervisor and District Agricultural Officer. The work of the depôt did not actually commence until April 1st when a clerk on Rs. 25 was appointed. Up to the close of the year the following were supplied from the depôt :—

Bonemeal	10 maunds.
Jute	1 maund.
Cotton	25 seers.
Dhaincha	15 „
Ground nut	32 „
Jowar	1 maund.
Maize	7½ seers.
Soybeans	5 „
Planet Jr. Handhoe	4
Turnwrest plough	1

From the Upper Shillong Farm the following were issued during the year :—

Seed potatoes	911 maunds.
Maize	5 „
Fruit grafts	12
Mulberry cuttings	24
Strawberry suckers	400
Bonemeal	80½ maunds.
Copper sulphate	1 md. 7½ seers.
Spraying ploughs	8

From the Jorhat Farm 5 sugarcane mills.

From the Jowai depôt bonemeal 60½ maunds.

Arrangements are being made to grind bones at Upper Shillong for sale to the Khasi cultivators. The machinery is now nearly complete and operations will be commenced shortly. It is hoped to supply the bonemeal at a small profit at about Rs. 3-8 per maund as against Rs 5, the present price of bonemeal delivered at Shillong from Calcutta. Six temporary depôts for the sale of seed potatoes were opened during the year in the Khasi Hills. The total quantity sold from the depôt was 106½ maunds in addition to 80½ maunds sold from the farm direct.

Section III.—Sericulture.

Sericulture in the plains.

37. In June 1913, Rai Bahadur Bhupal Chandra Basu was placed on special duty to enquire into the present condition of the silk industry in Assam. The greater part of his report, which is a very full one, was finished by the end of March. One chapter, however, cannot be written till the Principal of the Government Weaving Institute at Serampore, who was deputed to enquire into the weaving industry in Assam, sends in his note. Meanwhile Mr. Basu's report is being printed. As space is limited and the report will, in due course, be separately dealt with, I do not propose to discuss it here. I may add that Mr. Basu made some experiments in the Brahmaputra Valley with a view to see what could be done to improve the existing methods of rearing silkworms. An experiment was also made to find out whether *eri* silk could be carded and spun by means of the machinery used for cotton ; it was found that this could not be done.

Sericulture in the Khasi Hills.

38. The rearing of silkworms at the old Government Fruit Farm near Umlyngka was carried on by the Roman Catholic Mission. A grant of Rs. 1,500 was given to the Mission to enable them to construct a new rearing-house in the farm.

An account furnished by Dr. Becker of the operations conducted during the year is reproduced below :—

The rearing of silkworms at the Fruit Farm near Umlyngka began rather late this year. It was hoped that the new rearing-house, to the construction of which Government had graciously contributed Rs. 1,500, would be completed in good time ; but as this was not the case, the old houses were once more resorted to. Three ounces of French silkworm seed had been ordered from the Salvation Army, Simla, and one ounce of cellular eggs for experiment was sent by M. Leon Delonca from France, through the Agricultural Department, Assam. M. Delonca thinks that by successive cross-breeding he has succeeded in obtaining a race which would do well in our climate. Part of the French seed was given to Khasis who had applied for it. It can be said that both kinds of eggs gave very satisfactory results, and the outturn of cocoons would have been greater than in any previous year but for some rats that caused considerable damage by eating up a lot of small worms. The eggs hatched from the 15th—26th March at a temperature of 73°—80°F. There were luckily no deceased worms perceptible this year. Good coccons were obtained from both races ; on weighing them it was found that the French cocoons (eggs from Simla) were slightly lighter than the Delonca ones.

In the beginning of the current year two Khasi lads went at Government expense to Ramnuggar near Plassey (Nadia district), where they received a thorough training in silk-reeling at the Rose Filatures Concern. The Manager, M. DeMinvielle, was very much satisfied both with the conduct and the progress of the two Khasis, whom, on their leaving Ramnuggar, he furnished with certificates as trained silk-reelers. Thus it was made possible, for the first time, to reel the cocoons in Shillong itself, which means a great advantage indeed. Eight *chittacks* (¼ seer) of Delonca cocoons yielded eight tolas of raw silk, while the same quantity of French cocoons produced only 7 to 7½ tolas. Three seers of French cocoons were brought by a Khasi at Mahadeo ; they were reeled together with our own crop. The whole quantity of raw silk amounts to 3 seers, it will be sold to a firm in Germany. At present, experiments are being made with eggs of polyvultine races, Nistary and Hybrids.

The result of these experiments will be related next year.

Mr. B. C. Basu, who watched the last-mentioned experiments, reports that the Nistary and the Hybrid worms did remarkably well. They kept healthy all through and gave a full yield of cocoons which were of excellent quality. The total yield was 91 lbs. of green cocoons. These are now being reeled at the Fruit Farm. The seed was obtained partly from Pusa and partly from the Central Sericultural Nursery at Berhampore.

SECTION IV.—AGRICULTURAL SHOWS AND EXHIBITIONS.

39. The Agricultural Show for the Khasi Hills was held at Shillong on the 1st September 1913. Previously a combined Agricultural and Flower Show was held in May. September is more suitable for vegetables and field crops and the change in date was fully justified by the quality and number of the exhibits. The function was, on the whole, a huge success.

The associates and correspondents in the Khasi Hills, together with Siems, village headmen and other Khasias who take an active interest in agriculture, attended a meeting held at the Upper Shillong Station in July 1913. They were shown all the work in progress on the Station, especially the harvesting of potatoes; various questions of agricultural interest were also discussed.

SECTION V.—AGRICULTURAL ASSOCIATES AND HONORARY CORRESPONDENTS.

40. At the close of the year there were 28 correspondents against 25 in the previous year; three of them held the post of associate. A list of honorary correspondents is appended to this report. An account of the chief work done by them is given in paragraph 33. To the names mentioned there may be added that of Srijut Narayan Barua of Nakachari, who is doing good work. Many of them have failed to submit any account of what they have done, and I am afraid that this means that most of them have done very little. The matter was fully discussed in paragraph 34 of last year's report. I generally agree with what was said there and need not repeat it. I should add that efforts have been made this year to keep in touch with some of the honorary corespondents through the Agricultural Supervisor and the two District Agricultural Officers.

I may mention here that the mauzadar of Khowang, in district Lakhimpur, though not an honorary corespondent, is doing what he can to help the Department.

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

Cattle-breeding.

41. The proposal to establish a cattle-breeding farm in Assam has been kept in abeyance pending the receipt of Mr. Blackwood's report on the Special Enquiry into cattle-breeding held by him in Eastern Bengal and Assam in 1911-12.

The breeding operations at Upper Shillong were continued. The herd of Patna and cross-bred stock at the close of the year consisted of 59 animals against 56 in the preceding year. Eight bulls were sold during the year: of these four remained in the province, two in the Khasi Hills and two in the plains, while the other four were purchased by the Agricultural Department, Bengal.

The actual cost of maintaining the herd at the farm amounted to Rs. 5,805, and the receipts were Rs. 1,190: to this might be added the value of cowdung, estimated at about Rs. 1,000.

The people of this district do not take the advantage which they might of the existence of these cattle. The plan of lending out bulls for breeding purposes was tried, but it was found that the animals were neglected and the practice had to be abandoned. In view of this and the cost of maintenance, it will be a matter for consideration, when the new scheme of cattle-breeding is taken up, whether, as far as Shillong is concerned, the breeding of cattle should not be given up.

Sheep-breeding.

42. The results of sheep-breeding were disappointing. There was heavy mortality and the number of deaths was considerably larger than that of births. Only three animals, all of them Dumba

crossed Khasi breeding rams, were sold as against 6 last year, but the total stock fell from 171 to 136.

The climate and grass of the Khasi plateau apparently do not suit sheep well. Though grass is plentiful in summer, it seems to be lacking in nutrition, and the sheep do not put on flesh as quickly as might be expected.

Ninety-nine sheep were shorn last year : they gave a total outturn of 63 lbs. of wool, samples of which were sent to the Director General of Commercial Intelligence, who got them appraised by Messrs. Rali and Brothers of Calcutta. The valuations ranged from 5½*d.* to 8*d.* per lb. and compare very favourably with the current price of Indian or Tibetan wool. The fleeces were, however, extremely light, the heaviest weighing not more than 1½ lbs. and the average being considerably less.

Poultry breeding.

43. Poultry breeding under Government control continued at Aijal under the supervision of the Superintendent, Lushai Hills. His report for the year under review is reproduced here :—

The total number of eggs obtained from imported birds this year was 3,481 : 2,733 eggs were sold to Lushais and others at 2 annas each, and 726 eggs were used for hatching, from which 307 chickens were obtained, 160 chickens have died and the remainder 147 are still alive ; 30 fowls were sold during the year. The total sale proceeds of the Farm amounted to Rs. 496-12-6 against Rs. 316-4-0 last year, and total cost was Rs. 1,595-0-5 against Rs. 1,739-9-11 (1913-1914). No birds were imported during the year to renew the stock, but since the close of the year 1 Buff Orpington cock and 6 hens have been received through the Assistant to the Agricultural Adviser, Pusa. Fifteen Chittagongs, 10 Langshans, 1 Wyandotte, 3 Buff Orpingtons crossed with Chittagongs died during the year.

The following statement shows the number of imported birds in the district. The number shown in the villages are approximate:—

Name of fowls.	In the Poultry Farm at Aijal on first April 1914.	In the villages.	Remarks.
1	2	3	4
Chittagongs	73	9,658	Including chickens.
Langshans	19	438	
Buff Orpingtons	8	.....	
Buff Orpingtons crossed with Chittagongs ...	17	3	
Wyandotte	1	.....	
White Orpingtons	1	.....	
Lushai	21	.....	
Chickens	147	.....	
Ducks	11	.....	
Total	298	10,099	

The discouraging feature of the statement is that the English breeds with the exception of the Langshans have died out completely in the villages. The Chittagongs are the only breed that has done really well. It must be taken into consideration, however, that the year under report was particularly unfavourable for poultry. It was the wettest on record and many birds must have been weak from having been insufficiently fed during the scarcity. The year can thus hardly be regarded as a fair test, and the result next year may be better. The figures, however, show clearly that among the breeds tried the only breeds likely to permanently improve the fowls in the district are Chittagongs and Langshans.

The Political Officer of the North-East Frontier reports that a tentative effort at pigeon-rearing was made in the Abor Hills, but it did not meet with any success. The birds at Pasighat, though they flourished, refused to breed. Something also was done to improve the breed of poultry by the distribution of cockerels of good strains in villages near Sadiya.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications.

44. No bulletin or leaflet was published during the year. Steps are, however, being taken to revise and reprint some of the most important of those already published and to issue some new leaflets. A report on the work of each Agricultural Station is published annually in the autumn. An account of Agricultural demonstrations was published for the first time last year and a similar account will, in future, be published annually. A report

on the newly-opened Agricultural Experiment Station at Karimganj and one on the Sugarcane Experimental Station at Khagrabari in Kamrup will be published this year for the first time.

Statistical publications.

45. As usual, crop forecasts, weekly and annual season and crop reports, annual reports on tea culture, rail and river-borne trade, and frontier trade, periodical returns of rainfall, prices and trade, and all agricultural statistics were published by the Department.

Supply of information.

46. Various requisitions for information relating to the agriculture, sericulture and industry of the province were received from private individuals and concerns and complied with. Honorary correspondents and associates were supplied free with copies of all departmental publications and reports; they were also furnished with information and advice on agricultural matters when required.

Co-operation with the Economic Botanist to the Botanical Survey of India.

47. Last year, at the request of the Economic Botanist, economic products were collected and enquiries made in connection with them. The work was continued this year. Several plants were also sent to him for identification. Some Deputy Commissioners and honorary correspondents rendered valuable assistance in this connection.

CHAPTER VII.

MISCELLANEOUS.

Handloom weaving.

48. Babu Nani Gopal Mitra, a passed student of the Government Weaving Institute, Serampore, took up his duties as weaving master shortly before the commencement of the year. He spent the first nine months of the year in making a tour round the province in order to gain a first-hand knowledge of local weaving; for a part of this time he accompanied Mr. E. Hoogewerf, who visited Assam with a view to advising the Government as to the improvement of the weaving industry. The last quarter of the year was devoted by the weaving master to giving demonstrations of improved looms and weaving processes in a few selected centres. For the purpose of these demonstrations he was supplied with one Salvation Army and two Serampore fly-shuttle looms and one warping machine together with such accessories and weaving materials as were considered necessary. The demands for his services were so numerous that he was directed to limit his demonstration to a few selected places. These were Beani Bazar in Sylhet, Barpeta, Palasbari and some villages adjoining them. The demonstrations held at these places are reported to have been greatly appreciated by the weavers. The Salvation Army loom found great favour with the weavers of Beani Bazar, but its price stands in the way of its coming into general use. Except for certain parts which are patented, this loom can be locally manufactured at a greatly reduced cost. Mr. Basu endeavoured to persuade the Salvation Army authorities to reduce the cost of the patented parts so as to cheaper the loom, but the prices offered by them are still too high to suit the weavers. The Serampore fly shuttle looms also found favour with the weavers, and several of these have been locally made under the direction of the weaving master. It was also demonstrated that the efficiency of the native loom could be greatly increased at a cost of about Rs. 10 by attaching to it a fly-shuttle slay. A warping machine by means of which long warps can be prepared indoor is reported to have been greatly appreciated at Barpeta.

The weaving master was on tour for 274 days during the year and appears to have been usefully employed throughout. He rendered much help in the organising and equipping of the recently established weaving school at Tipkai in the Goalpara district, and also took part in the formation and reconstruction of several co-operative societies intended for the promotion of the weaving industry.

General progress.

49. In paragraph 44 of last year's report my predecessor reviewed very fully the position and progressof the Department, at the same time pointing out the lines on which, in his opinion, it should advance. Apart from the fact that I am in charge only for a few months, considerations of space stand in the way of any attempt being made by me in the same direction.

I take this opportunity, however, of expressing my strongest agreement with Mr. McSwiney as to the great importance of attention being devoted to the chief staple products of the province and, above all, to paddy. A good start has been made with the opening of the experimental paddy farm in Sylhet and the sugarcane farm in Kamrup.

I think that the Report itself shows how substantial an advance has been made in various directions. Having myself joined the Department only recently, I feel little hesitation in drawing attention to this.

Co-operative Societies and Agriculture.

50. Attempts have been made to bring about a closer connection between the work of the Departments of Agriculture and Co-operative Societies. At the request of the Registrar good seed was supplied to certain Societies by this Department. With the help of Mr. Basu, the Inspector of Co-operative Societies organised a Society of weavers of Beani Bazar in Sylhet. A Credit Society, all the members of which are weavers by trade, was also opened at Sualkuchi, the centre of the weaving industry in Assam.

The Registrar, at the suggestion of Mr. Basu, has allowed certain Societies in the neighbourhood of Palasbari to amend their bye-laws, so that they may add co-operative methods of production and sale to their existing activities. Co-operative Societies would be useful channels for the distribution of good seeds, etc. The Agricultural Department will in time be in a position to supply selected paddy seed and sugarcane sets. There is an undoubted demand among Co-operative Societies for the latter, but the Khagrabari Sugarcane Farm required all that this Department could supply. We are only now beginning selection work in paddy.

There are various other lines on which the Departments might work together The subject has, however, been dealt with separately and I need not go into detail With a whole-time Registrar and a more highly staffed Agricultural Department there should be facilities for more work in common than is at present possible.

Notice of services.

51. In last year's report Mr. McSwiney spoke in the highest terms of the work of Mr. Birt, Deputy Director of Agriculture, and of Mr. Meggitt, Agricultural Chemist. Mr. Meggitt has been on leave practically from the day on which I took over charge, but I am in a position to agree fully as to the great value of the services of Mr. Birt.

Rai Bahadur B. C. Basu has a long record of good service; while working practically as a Deputy Director he has been able to add to this.

Maulvi Fazlal Huq Ahmed, Agricultural Supervisor, did good service in supervising the opening out of the Khagrabari Sugarcane Farm, in addition to his other duties.

The Superintendent of the Shillong Farm, U Herrick Singh, has continued to do good practical work.

The work of Srijut Bina Ram Das, Superintendent of the Jorhat Farm, for the past year is very favourably reported on.

U Harry Singh, as usual, worked well as Overseer in charge of demonstrations in the Khasi Hills.

Babu Satyendra Chandra Dutta, probationary District Agricultural Officer of Kamrup, made very good use of his time and promises well.

Among the demonstrators, Bireswar Das deserves special mention; he was of the greatest assistance in helping to open out the new sugarcane farm.

My best thanks are due to the office staff; Babu Raj Kumar Nandi, Head Assistant, who is on the eve of retirement, has long been associated with the Department. His services have been of considerable help to me.

A. R. EDWARDS,

Director of Land Records and Agriculture, Assam.

Shillong,
The 10th September 1914.

APPENDIX I.

List of honorary correspondents of the Department of Agriculture in Assam (the names of correspondents who are also associates are marked).*

SYLHET.

1. D. Ferguson, Esq., Dhamai tea estate, post office Dakhintag.
2. Babu Girija Nath Biswas, post office Baniachang.
3. „ Hara Kishore Gupta, post office Pail, Habiganj.
4. „ Bharat Chandra Chowdhury, Salchapra, Cachar.
5. „ Pavitra Nath Das, post office Beani Bazar.
6. „ Amar Nath Ray, B.A., Sunamganj.
7. „ Ambika Charan Bhattacharji, post office Lauta.
8. „ Basanta Kumar Nandi, post office Itakhola, Assam-Bengal Railway.
9. „ Biday Kumar Chowdhury, Sunamganj.
10. „ Baisnab Charan De, post office Kaliganj Bazar.
11. Maulvi A. M. Chowdhury, Zamindar, Kanihati, post office Hazipur, South Sylhet.
12. Babu Sarada Charan Chakravarty, B A., Deputy Inspector of Schools, Hatiganj.
13. Maulvi Abdul Rahim Chowdhury, Zamindar, village Sultanpur, post office Jalalpur, Sylhet.

KHASI AND JAINTIA HILLS.

14. U Job Solomon, Shillong.
15. U Kubur Singh, Mylliem.
16. U Bordhan Ray Kanti, Mahadeb, Cherrapunji.
17. U Halikton Passah, Head Master, Upper Primary School, Jowai.

GOALPARA.

18. Babu Dijesh Chandra Chakrabarti, Manager, Gauripore estate.
19. „ Lalit Mohan Dutta, Dhubri.

KAMRUP.

20. E. P. R. Gilman, Esq., Barduar tea estate, post office Palasbari, Kamrup.
21. Rai Sahab Chidananda Chowdhury, Gauhati.
22.* Babu Mahendra Mohan Lahiri, Gauhati.
23. Munshi Tayab Ali, Sonapur, Kamrup.

DARRANG.

24. Babu Jatindra Chandra Maitra, Tezpur.

NOWGONG.

25. Babu Jnan Chandra Ray, Baithulongso, post office Kampur.

SIBSAGAR.

26.* Babu Akshoy Kumar Ghose, Sibsagar.
27.* Srijut Debeswar Gossain, Barpathar, Sugarcane Farm, post office Badlipur (Golaghat).
28. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1914.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(a) Sale of manure, farm produce ...	3,865 5 0	(1) Superintendence	23,604 13 1
(b) Potatoes	2,478 0 9	(2) Agricultural instruction ...	1,443 14 0
(d) Other receipts	119 7 3	(3) Agricultural Chemist... ...	2,666 4 7
		Experiment Stations ...	1,21,486 11 8
		(4) Agricultural Demonstrations and experiments.	9,121 1 0
		(5) Public Exhibitions and Fairs ...	921 15 9
		(6) Sheep and Goat breeding operations	484 5 3
		(7) Poultry-breeding operations ...	1,887 13 0
Total receipts	6,462 13 0	Total expenditure ...	1,61,616 14 4

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Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 4324R., dated the 28th October 1914.

Read—

The Report of the Department of Agriculture, Assam, for the year ending 30th June 1914.

RESOLUTION.

THE prosperity of Assam depends so largely on the development of its agriculture that the success which attends the work of the Agriculture Department is of exceptional importance. It is therefore with pleasure that the Chief Commissioner has read the record of the work achieved in the past year, a record which shows undoubted progress and a considerable extension of the activity of the Department. Two new stations were opened, one at Karimganj in Sylhet, the other at Khagrabari in Kamrup. At Karimganj experiments will be made in rice with the object of distributing improved seed throughout the province, while the cultivation of sugarcane on a large scale with the aid of steam tackle has been initiated at Khagrabari. The Chief Commissioner will watch the results of these important experiments with the greatest interest, as their success must lead to a great increase in the material prosperity of the people. An honorary correspondent in the Sibsagar district gave a practical example of the benefit to be obtained from new and improved methods. He found that paddy planted with two seedlings only to the bunch yielded at the rate of 3,210 lbs. per acre, whereas paddy planted in the usual manner with from six to ten seedlings to the bunch only gave 2,226 lbs.

2. At the Jorhat farm experiments were made in the value of different manures and different varieties of sugarcane. The superiority of the imported cane was demonstrated by a private gentleman who found that the net profit per acre obtained from the imported cane was Rs. 151 as compared with a profit of Rs. 23 given by local cane. At Shillong the process of growing and distributing improved varieties of potatoes was continued with excellent results. The rapid progress made in the development of the Fruit Experimental Station at that place and the success already achieved reflects the greatest credit on Mr. Holder's energetic and able management. Apart from the work done at the Government stations, successful demonstrations were carried out in the use of bonemeal and flour phosphate manures in the Khasi and Jaintia Hills and Sibsagar, and arrangements have now been made for the manufacture of bonemeal at Shillong so that it can be supplied at a reduced cost to cultivators in the Khasi and Jaintia Hills. Experiments made in this district showed that bonemeal returned a net profit of over 100 per cent. on the capital expended on it. In the plains the value of manure could not be proved in so conclusive a manner.

3. The value of an improved type of sugarcane mill has been brought home to the raiyats in the Sibsagar and Kamrup districts, and there would be a great demand for them if the cultivators could obtain advances for their purchase or could buy them on the instalment system. This is a matter in which the assistance of Co-operative Societies will be invoked. Further progress was made with the introduction of the potato into the Lushai Hills, and its cultivation has now been started in the Naga Hills and on a small scale in the North-East Frontier Tract. Attempts to introduce terrace cultivation in place of the system of *jhuming* have so far met with little success. In the Lushai Hills little was done, and so long as land there is available for *jhuming*, the Lushais are not likely to undertake the trouble of terrace cultivation. Experiments on the southern slopes of the Khasi and Jaintia Hills proved a failure and it is proposed now to try wet rice cultivation there. An attempt is being made to introduce terrace cultivation into the Garo Hills, and Garos were sent to study the methods employed in the Naga Hills. The attention of the Department very properly has been and will be directed mainly to the improvement of the staple crops of the province, but the question of the extension of jute cultivation in Assam has not been overlooked. The influx of settlers from Eastern Bengal has already led to increased cultivation of this crop, and a large area of land in Kamrup has been settled on favourable terms with a leading Calcutta firm to enable an experiment in jute cultivation to be carried out on an extensive scale.

4. During the year Rai Bahadur B. C. Basu was placed on special duty to report on the silk industry of the province. His report has not yet been received. The Roman Catholic Mission in Shillong continued the work of rearing silkworms and

a grant of Rs. 1,500 was given by Government to enable the Mission to construct a new rearing house. The Chief Commissioner is glad to learn that the services of the weaving master were so keenly appreciated that he was unable to visit all the places where he was asked to give demonstrations with improved pattern looms. The cost of the best looms stands in the way of their being brought into general use, but the weaving master was able to show that the ordinary loom in use could be improved at a small cost, and the weavers generally appear to appreciate the importance of his instructions.

5. On the completion of his special enquiry into the condition of the silk industry in the province Rai Bahadur B. C. Basu was placed on special duty to assist the Deputy Director. The extension of the Department's activities has brought with it such an increase in the work of inspection and administration that a second Deputy Director is required, and the question of his appointment is under consideration. An Entomological Assistant joined the Department in December and it is hoped that his researches will ultimately lead to a great reduction in the damage done by insect pests.

The District Agricultural Officers, whose employment was sanctioned as a tentative measure in the districts of Sylhet and Kamrup, have proved a success, and similar appointments will be made in other districts, when suitable men can be obtained and funds permit. One additional post has already been sanctioned for the Garo and Khasi and Jaintia Hills. The need of more fieldmen demonstrators is keenly felt and three more apprentices have been engaged. But the staff of the Department requires still further strengthening if it is to deal in any way adequately with the important work which falls within its scope. The Director has been asked to state his requirements fully and his proposals will receive sympathetic consideration.

The Chief Commissioner also desires to call attention to the desirability of securing a wide circulation of the bulletins issued by the Department, in order that useful agricultural knowledge may be disseminated and the work of the Department brought home to cultivators. Sir Archdale Earle will shortly address the Divisional Commissioners on this point.

6. The Chief Commissioner fully endorses the Director's remarks on the importance of close co-operation between the Department of Agriculture and Co-operative Societies. The formation of a separate Department for the control of Co-operative Societies and the industries of the province is now under consideration. If the proposal is sanctioned, the officer appointed to hold charge of new Department will be instructed to give this question his special attention.

7. The Chief Commissioner has pleasure in acknowledging the energy and ability displayed by Messrs. McSwiney and Edwards who were in charge of the Department during the year under report. He has also read with pleasure of the good work done by Mr. Birt, Rai Bahadur Bhupal Chandra Basu, Mr. Holder, Maulvi Fazlal Huq Ahmed and the other officers mentioned in the report. He desires also to acknowledge the assistance given by honorary correspondents and other gentlemen who are interested in the development of important agricultural industry. There are few departments of Government which will have greater opportunities of conferring benefit upon the people than the Department of Agriculture, and the Chief Commissioner is glad to learn that the year has been a year of decided progress and that the officers of the Department are fully alive to the importance of their work.

Ordered that a copy of this Resolution and of the Report be published in the *Assam Gazette* for general information.

By order,

B. C. ALLEN,

Chief Secretary to the Chief Commissioner of Assam.

N 38874
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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending the 30th June 1915.

SHILLONG:

PRINTED AT THE ASSAM SECRETARIAT PRINTING OFFICE.

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A. R. EDWARDS, Esq., B.A., I.C.S.,
DIRECTOR, DEPARTMENT OF LAND RECORDS AND AGRICULTURE, ASSAM.,

THE CHIEF SECRETARY TO THE CHIEF COMMISSIONER OF ASSAM.

Dated Shillong, the 15th September 1915.

I HAVE the honour to submit the Annual Report of the Agricultural Department for the year ending the 30th June 1915.

I have the honour to be,

SIR,

Your most obedient Servant,

A. R. EDWARDS,

Director of Land Records and Agriculture, Assam.

[Prescribed maximum length—12 pages.]

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REPORT

OF THE

AGRICULTURAL DEPARTMENT, ASSAM,

FOR THE

Year ending the 30th June 1915.

CHAPTER I.

ADMINISTRATION.

Director.

1. With the exception of some 4 months during which I was in charge of the Department, Mr. McSwiney was the Director for the whole period under review. I was relieved by Mr. McSwiney on the 10th September 1914, but he again proceeded on leave on the 27th April 1915 making over charge to me. He spent 128 days on tour, while I was on tour for 38 days. We both inspected the Farms at Karimganj, Khagrabari and Upper Shillong. Both of us paid special visits during the year to Khagrabari in connection with the laying out of the Kamrup Sugarcane farm. Interviews and discussions with Honorary Correspondents constituted one of the items of work done by us during our tours. The Director of Agriculture is also Director of Land Records and the latter Department claims a large share of his attention.

Members of the superior staff.

2. Mr. A. G. Birt held the post of Deputy Director of Agriculture up to May 14th, when he went away on military duty having received a Commission in the Indian Army Reserve of Officers. He was on tour for 232 days, exclusive of visits to the Upper Shillong Farm, which at the request of Rai Bahadur B. C. Basu, in whose immediate charge it is, he inspected occasionally.

He was in charge of the Jorhat and Kamrup Farms, and of all demonstration work in the Assam Valley and the Khasi and Jaintia Hills. He visited the Jorhat Farm 11 times and the Kamrup Farm 13, halting for some days on each occasion.

Tours were made by him in the Khasi and Jaintia Hills, the Sibsagar and Kamrup districts, and the Garo Hills, mainly with the object of inspecting demonstrations. In November, accompanied by Mr. Chaston, the Manager of the Kamrup Farm, he visited Pusa in order to obtain information as to Motor cultivators. Other tours included visits to Dibrugarh in connection with the demonstration work of Honorary Correspondents and to Dimapur where he consulted with the Political Agent, Manipur, regarding cattle-breeding and the establishment of a Model Farm. He also visited Messrs. Birkmyre's Jute Farm and the farm of the Rangia Estates Limited in connection with manurial schemes and went to Karimganj to consult with the Special Officer and the Economic Botanist, Bengal, regarding the work of paddy selection.

Mr. Meggitt, Agricultural Chemist, returned from leave on the 8th March. He took over charge of the office of the Deputy Director of Agriculture with effect from the 14th May. As Agricultural Chemist he was on tour for about 10 days and visited Gauhati and the Sugarcane Farm.

Rai Bahadur Bhupal Chandra Basu, who acted practically as Deputy Director of Agriculture, continued to be on special duty in this Department and remained throughout the year in charge of the Shillong and Karimganj Farms, as well as of demonstration work in the Surma Valley. He was also entrusted with the duty

of controlling the work of the Weaving Master. During the year Mr. Basu spent 192 days on tour: 102 days were spent by him in organising the Karimganj Farm and supervising its working, 33 days were devoted to the Upper Shillong Farm, while the remaining time was spent for the most part in inspecting agricultural and weaving demonstrations.

Mr. R. S. Finlow, Fibre Expert to the Government of Bengal, visited Kumarikhata in Kamrup during the year, with a view to inspecting and advising on certain experiments in the cultivation of flax, which had been taken up on the estate of Messrs Birkmyre.

Mr. C. H. Holder continued to hold charge of the Fruit Experiment Station at Shillong.

Mr. Chaston was in charge of the Sugarcane Farm at Khagrabari from July 1914.

Subordinate establishment.

3. Maulvi Fazlul Haq Ahmad held the post of Agricultural Supervisor throughout the year. He was in general charge of all demonstration work in the Assam Valley and was on tour for 260 days, inspecting demonstrations and visiting the Honorary Correspondents of the Department. The appointment of Mr. Barthakhur as Agricultural Supervisor for the Surma Valley was sanctioned during the year; he did not join, however, till after its close. U Herrick Singh, Srijut Binaram Das and Babu Rukmini Mohan De continued to hold charge, respectively, of the farms at Shillong, Jorhat and Karimganj. The staff of the Karimganj Farm includes an Assistant Farm Superintendent and that of the Shillong Fruit Experiment Station an Overseer. There is also a clerk at each farm.

Babus Benode Behari Das and Satyendra Chandra Datta held the posts of Agricultural Inspector at Sylhet and Kamrup respectively. The post of a third Inspector was sanctioned for the Khasi and Jaintia and Garo Hills, and U Harry Singh, Overseer of the Upper Shillong Farm, was appointed during the year. A detailed account of the work of these Inspectors will be found in Section I of Chapter IV. The appointment of two more Inspectors was sanctioned; one of these was for Sibsagar and the other for Cachar and for the Karimganj subdivision of Sylhet. The posts were not filled till after the close of the year.

Srijut Noresh Chandra Das, Entomological Assistant, having resigned his post from the 11th February 1915, Babu Satya Ranjan Gupta, a Demonstrator in Entomology in the Sabour Agricultural College, was appointed in his place. He joined after the close of the year under review. An account of the chief work done by Srijut Noresh Chandra Das is given in Section III of Chapter III of this report.

Mr. M. Smith, a qualified apprentice of the Upper Shillong Farm, was appointed Agricultural Instructor in the North-East Frontier. He was engaged chiefly in looking into the local methods of potato and mustard cultivation.

During the year 8 demonstrators were employed of whom 4 were attached to the Assam Valley, 3 to the Khasi Hills and 1 to the Garo Hills. These demonstrators include two apprentices of the Jorhat and one of the Upper Shillong Farm who having finished their training were appointed demonstrators during the year.

Expenditure and receipts.

4. The expenditure of the Department during the agricultural year, which ended on the 30th June 1915, amounted to Rs. 2,36,498-7-5 and the receipts to Rs. 10,191-12-4 against Rs. 1,61,616-14-4 and Rs. 6,462-13-0, respectively, for the previous year. The principal heads of expenditure are shown in Appendix II. The cost of steam tackle for the Khagrabari farm and the strengthening of the staff are mainly responsible for the increased expenditure.

The increase in the receipts of the Department is especially satisfactory, inasmuch as it is due to a larger sale of seeds, etc., from the Seed Depot and of the produce of the Farms.

CHAPTER II.

AGRICULTURAL EDUCATION.

Nature study in schools.

5. Work in regard to nature study and agricultural education in schools has proceeded on the same lines as during the past two years and there is nothing new to record. As stated in last year's report, the Education Department provides gardens and seeds for primary schools and teaches practical work in the gardens. Stress is laid on nature study, and the Lower Primary Readers in use contain lessons on this and agriculture generally.

Apprentices on Government Farms.

6. In view the needs of the Department for fieldmen demonstrators in the plains the annual appointment of four apprentices, instead of two, at each of the two farms at Jorhat and Karimganj has been sanctioned. The training lasts two years and is thoroughly practical. The apprentices are made to take an active part in all agricultural operations on the farms. At the close of the year there were 6 apprentices at the Jorhat Farm and 4 at Karimganj, while the Upper Shillong Farm and the Shillong Fruit Experiment Station each had two. A Garo youth has been also under training at Upper Shillong since April 1915 ; should his work prove satisfactory, he will eventually be employed as a demonstrator in the the Garo Hills.

Sabour Agricultural College.

7. During the year the number of Agricultural Scholarships for the Province was increased to four. Three scholarships were granted to the three fieldmen clerks of the farms at Karimganj, Jorhat and Upper Shillong and the fourth was awarded to a first-year student of the Nagpur College who has since joined at Sabour. The stipendiary of 1914 has completed his first-year's course and obtained promotion to the second-year class. He is reported to have been doing well. The Sylhet Students' Fund granted a scholarship of Rs. 20 per mensem to one Dinesh Chandra Das who is now in the second-year class of the Agricultural College at Sabour.

CHAPTER III.

EXPERIMENT AND RESEARCH.

SECTION I.—Agriculture.

Experiment Stations.

8. At present there are five Experiment Stations in the Province, namely, the Fruit Experiment Station at Shillong, the farms at Jorhat, Karimganj and Upper Shillong and the Sugarcane Experiment Station at Khagrabari in Kamrup.

Soil investigations.

9. Experiments at Jorhat with lime, phosphate and green manure continued to be carried on and were extended. Some most interesting results have been obtained. Mention may be made of the remarkably beneficial rôle which organic manures play in the economy of plant production in this soil. From the cultivator's point of view the results obtained in the experiment with wood ashes are the most striking. These show that, for the purpose of growing *rabi* crops, it will pay the cultivator to conserve ashes and apply them regularly to the soil. The expriment which was laid down in 1912, with a view to ascertain the reasons underlying the remarkable effect of lime, has been continued. The results of this investigation up to date were published during the year as a Memoir of the Department of Agriculture in India, entitled " Studies of an Acid soil in Assam." A full account of the work up to date is given in the report of the Jorhat Experiment Station for the year ending the 30th June 1915.

Sugarcane.

10. The variety tests and planting experiments were continued at Jorhat. This year's yields of ratoon cane were in considerable excess of last year's. The same three varieties, *viz.*, B 147, B 376, and striped Mauritius, which have consistently done best for years, still continue to take the lead. For the first time for many years, the local variety of cane, ***Magh***, produced a small ratoon crop ; this amounted to some 11½ tons of cane per acre. This is probably due to the decrease, owing to preventive measures being taken, in the incidence of attacks by cane borer and other diseases.

The yields of cane and sugar per acre produced this year by the plant cane were lower on the average than those of the past few years, the results approximating to those obtained on the same area in 1910-11. The abnormally dry season appears to be responsible. With regard to differential manurial treatment, cowdung gave better results than cowdung *plus* oilcake. A similar difference between the phosphate and non-phosphate area exists in favour of the latter. The difference in both cases, however, being within the margin of 10 per cent. permissible for experimental error in field experiments, a further trial will be made. The results of planting experiments during the year indicated that, under the existing conditions of soil and manuring, something like 8,000 sets is the most economical rate per acre. As regards the distance from one another at which rows of cane should be planted, the results confirm the experience of previous years, *viz*, that a spacing of 4 feet between rows gives a higher plant cane crop than one of 5 feet; this, however, is not the case as regards the ratoon crop which follows. For the two crops combined, under our conditions of soil and manuring and of disposition of sets within the row, planting in rows 4 feet apart gives the larger total yield. This year three new varieties of cane were received from Barbadoes ; of these two showed exceptional promise.

A full account of the sugarcane work at Jorhat is given in the report on that station.

Sugarcane cultivation by steam tackle.

11. During the year, the work at the Kamrup Sugarcane Farm entered upon the first year of the experiment proper; the previous year's work which was preliminary to this mainly consisted of the planting of 23 acres of cane to provide planting sets for the year under report. The steam cultivating tackle arrived in December 1914, and by March 1915 two large blocks of some 60 acres each, on a site lying some two miles north of that planted in the previous year, had been reclaimed from jungle and prepared for planting. This latter site had proved unsuitable for cane on account of drainage difficulties. Chiefly owing to this, it was possible to grow only enough cane to plant some 10 acres on the new site. For various causes, the chief of which were the abnormal amount of rain early in the season, the late arrival of the cultivating tackle and some difficulty with labour, planting was not finished till the middle of May. Though all available labour was employed on the work of drainage immediately after planting, unusually heavy rain which followed it and persisted long after the end of the year under report gave the young cane little chance. One fact which our work here up to date clearly shows is that thorough drainage is the very essence of the problem of cane culture in this tract. The higher lying areas grow good cane, while the fact that other crops grow well on the farm without any manure goes to show that the soil is inherently fertile. The water table is high and this further complicates the drainage problem. With a view to carrying out drainage work more efficiently, a drain trenching implement to be worked by the steam tackle has been ordered for November 1915, in readiness for the coming year's work. It may be mentioned here that owing to the unsatisfactory nature of the local (Kachari) labour it was found desirable to import some labour from Ranchi. The number of coolies required was small and the Manager found no difficulty in getting them. An account of the work done on the farm during the year appears in the report of the Kamrup Sugarcane Station to date June 30th, 1915.

Rice.

12. The experiment in the line breeding of rice which was started last year was proceeding at the Karimganj Farm but was abruptly terminated by the high floods of June and July last. The experiment was with four classes of rice, *viz.*, early and transplanted *aus* rice, *sail* or transplanted winter rice and *asra*; this last comprises the comparatively short stemmed varieties of *aman* or swamp winter rice and can be grown either broadcast or transplanted. There were altogether 145 varieties, or, strictly speaking, lots of country seed used in the rice breeding experiment. These were sown in 1914 and furnished an aggregate of 945 types of grain. All but 57 of these having been destroyed, it is necessary to make what practically amounts to a fresh start. A full account of the rice experiment will be found in the annual report of the Karimganj Farm.

An experiment in " warping " of rice land was made at the Upper Shillong Farm This means the covering of the land with a layer of soil deposited by water. One acre of land was taken up for the purpose. A slow current of water laden with soil was thrown into the land and shifted from place to place, with the result that the whole of the land was covered with a layer of silt about 3 inches thick. It was then sown with wet rice. The crop is reported not to be very promising, though better than that of the previous year.

Potatoes.

13. At Upper Shillong experiments with potatoes were continued. They included trials of varieties and of different seed rates. On the average of the past four as well of the past seven years the varieties known as " King of Potatoes " and " Magnum Bonum " have given the best yields. These two varieties have been grown for some years past for the purpose of distributing seed in the Khasi Hills and in the Province generally. This year, however, the highest yield was given by a kind of potato called the " British Queen. "

Owing to excessive rain, potato disease appeared earlier and in a more aggravated form than usual. The proportion of diseased tubers was larger than in 1914 though not so large as in some previous years. In spite of the fact that there has been a good deal of disease this year, there is reason to believe that the use of Bordeaux mixture year after year and the practice of growing the crop on ridges have tended to reduce the extent of disease in the potato stocks of the farm.

The total outturn was 1,063 maunds and the average yield per acre amounted to a little over 118 maunds per acre against 155 maunds in 1914: some 50 maunds of potatoes were also obtained from the variety experiment.

Twenty-eight pounds of seed of each of nine varieties of English potatoes which were imported during the year were planted. Some of the varieties germinated badly and none of them gave satisfactory results. The experiment will be repeated in autumn. Seven new types of potato bred on the farm were grown during last summer with a view to multiplication of seed. It is intended to experiment with them against the best varieties usually grown on the farm.

The total outturn of potatoes grown in 1914, the summer and winter corps being taken together, was 2,196 maunds, of which 1,062 maunds were sold for seed. An interesting and, I think, very satisfactory feature of this work is that some 400 maunds of these seed potatoes were disposed of outside the Khasi Hills.

A full account of the potato experiments is given in the report of the Upper Shillong Farm.

Green manure crops.

14. At Jorhat the regular rotation provides for green manuring with cowpeas once in 4 years and this practice has proved uniformly successful. Cowpea as a soil regenerator has fully proved itself to be the best green manure crop on the old alluvium at Jorhat. It is occasionally objected to on the ground that it forms long creeping vines. From variety tests made last year, it is evident that great differences exist in this respect between different varieties. One variety produced no vines at all; should this habit proved to be a fixed characteristic, the cowpea bids fair to become the green manure crop of Assam. *Dhaincha* and *sunn* hemp were grown for trial on small areas. Velvet beans and sword beans were tried on a small scale and made excellent growth. Green manuring for rice with these two crops was also tried at the Karimganj Farm.

Fodder crops.

15. At Upper Shillong several fodder crops were tried; maize gave the most satisfactory result. *Raishan*, a millet extensively grown in the Khasi Hills, has been successfully cultivated as a hay crop since 1912. The hay produced this year was of excellent quality. It has proved a valuable winter food for cattle. *Jowar* which was sown for fodder at the Kamrup Farm is doing excellently.

Other crops.

16. At Jorhat different kinds of cowpeas, soybeans, groundnuts, indigo and cotton were included among the crops sown for trial on small plots. The *Buri* and Camoddia cotton did better than last year. The other crops also grew fairly well. All the varieties of groundnuts did well, but they were, as usual, attacked by rats and little seed was left.

An interesting experiment with jute was made at the Karimganj Farm. A pure line bred by Mr. Finlow, the Fibre Expert of Bengal, a local variety and one obtained from Goalpara were tested in order to see which would give the best yield. The result of this experiment has not yet been reported. At Shillong, rhubarb, asparagus, buck wheat and different kinds of maize were grown with fair success during the year.

Fruit.

17. The Fruit Experiment Station at Shillong continued, under the skilled and careful supervision of Mr. C. H. Holder, to make satisfactory progress. The total area of garden is 47·90 acres, of which little more than 16¼ acres, which is planted, is suitable for fruit-growing. The terracing of the planted area is nearly completed. It has been most successful in preventing the denudation of the soil by rainfall. Heavy hailstorms during the year damaged the garden a good deal. A full account of the work up to the end of June has been published in a separate report. It is too early to express an opinion as to whether the experiment is likely to be a success; prospects seem, however, to be hopeful.

Section II.—Agricultural Chemistry.

18. Mr. A. A. Meggitt, the Agricultural Chemist, was on leave till the 7th March 1915. After his return, in the absence of a laboratory, the building of which has not yet been commenced, no chemical work except the analysis of sugarcane varieties at Jorhat was possible. Mr. A. G. Birt, Deputy Director of Agriculture, being gazetted in May as Second-Lieutenant in the Indian Army Reserve of Officers, Mr. Meggitt took over charge from him. In addition to his work at Jorhat in connection with sugarcane he resumed work on soil investigations and green manuring problems.

Some of the work in connection with soils, which is becoming more and more technical in character, is suffering badly through there being no laboratory. In order that it may be carried out satisfactorily, it is essential that work in a laboratory should be done at the same time. Till the laboratory is ready much valuable information will necessarily be lost.

Section III.—Entmology.

19. As in last year, the Entomological Assistant was engaged in examining crops, making notes on insect pests found on them and instructing cultivators with regard to preventive and remedial measures. He also prepared a list of insect pests observed by him in the course of the year. Reports of insect pests were attended to by him and advice was given when possible. An attack of rice-bug was reported from the Khasi Hills. The Entomological Assistant visited the localities concerned and demonstrated remedial measures.

A small laboratory is being fitted up for his work.

CHAPTER IV.

DISSEMINATION.

Section I.—Demonstration.

20. Demonstrations were carried out in four districts, *viz.*, Sibsagar, Kamrup, Sylhet and the Khasi and Jaintia Hills. The Agricultural Supervisor and the Agricultural Inspector, assisted by the demonstrators, were in immediate charge of the work in the Assam Valley. The Agricultural Inspector, Khasi and Jaintia Hills, with the assistance of demonstrators conducted the demonstrations in that district. In Sylhet demonstrations were made by the Agricultural Inspector alone.

Localities.

21. Manurial demonstrations with bonemeal and flour phosphate laid down in 1913 in Kamrup and Sibsagar were kept under observation during the year, with a view to ascertaining the residual effect. In Sibsagar, the average increase in yield of the manured over the untreated plots was almost identical, *viz.*, 300 lbs. of grain per acre in the case of both bonemeal and flour phosphate, in this, the second year of the experiment. For the first two years the flour phosphate has given a total net profit of Rs. 19-3 and the bonemeal of Rs. 9-7 per acre. In Kamrup flour phosphate was not so effective as bonemeal, the average net profit for the second year of the demonstration being Rs. 3-4 and Rs. 9 per acre for land treated with flour phosphate and with bonemeal, respectively.

Rice.

During the year demonstrations with bonemeal were made at 12 new centres in Sibsagar and 10 in Kamrup. At each centre one plot was manured with bonemeal at the rate of 3 maunds per acre, the other plot being untreated. In Sibsagar the manured plots showed an average increase of 330 lbs. per acre, valued at Rs. 12; the cost of bonemeal, Rs. 9, being deducted the net profit was Rs. 3 per acre. In Kamrup the results showed in the plots treated with bonemeal an increase of 282 lbs. per acre in the case of *aus* paddy and 150 lbs. in the case of *sali* paddy.

In Sylhet also five demonstration plots of 1913-14 were kept under observation in order to note the residual effect of the manures in the second year. In three places definite results were obtained and the use of bonemeal was found to leave a handsome profit. Flour phosphate gave a satisfactory net profit in the case of two out of the three demonstrations: in the third its cost was just recovered. Four new demonstrations with these manures were made on land belonging to Honorary Correspondents. The application of 3 maunds of bonemeal gave a net profit of Rs. 18-4 per acre. In the same plot the use of flour phosphate at 3 maunds per acre costing Rs. 7-8 yielded a net profit of Rs. 6-10. It is expected that the manures on these plots will have a beneficial effect for a year or two longer.

In the Khasi Hills demonstration work underwent a considerable extension during the year. New work was undertaken in 10 centres. Bonemeal was applied at the rate of 3 maunds per acre, and the results checked against adjacent untreated plots. The plots which were treated with bonemeal gave a gross profit of Rs. 27-12 per acre on an expenditure of Rs. 15, leaving a net profit of Rs. 12-12 per acre. A trial was also made for the first time with Egyptian raw phosphate against bonemeal and against no manure. This demonstration was spoilt, however, by the ravages of insects. The plot which was treated with bonemeal yielded 720 lbs., that with

Egyptian phosphate 510 lbs and the untreated plot only 360 lbs. of paddy grain per acre. On the average yield of the second year's demonstrations the average profit per acre was Rs. 9-2 for plots treated with bonemeal and Rs. 4-4 for those treated with flour phosphate. The total net profit per acre for the first two years of these demonstrations averages Rs. 26-4 in the case of the former and Rs. 13-4 for the latter. The demonstrations were, more or less, spoilt by insect pests which were unusually numerous during the year.

Sugarcane.

22. As the whole of the cane available for planting was sent to the Kamrup Farm, no fresh demonstrations of superior varieties of cane were made in 1914; some were, however, begun in the spring of 1915 at several centres in Sibsagar and Kamrup. That our improved varieties of cane are much appreciated and fast gaining in popularity with the cultivator admits of no doubt. During the year some 70,000 sets were distributed in the Assam Valley alone; of these some 30,000 cuttings were sold to cultivators at a nominal price, or distributed free for demonstration purposes, from the Jorhat Farm, while 40,000 sets were supplied on easy terms by the Manager of the Mowkhuli Sugar Farm at Tinsukia at the request of this Department. These varieties were also introduced into Kamrup where 10,000 sets were distributed.

Demonstrations with three roller iron bullock-power-crushing mills were continued during the year. These mills are rapidly rising in public appreciation. In Sibsagar four mills were sold, three were hired out for the whole crushing season and nine were sent out for demonstration purposes. The use of these mills was demonstrated in six centres in Kamrup and as a result thirteen mills were sold. Two co-operative societies purchased three mills. It is hoped that in the near future each village will possess at least one of these crushing mills.

Potatoes.

23. In Sylhet demonstrations with English potatoes were made this year for the first time. There were 32 demonstrations, of which twelve were made under the personal supervision of Honorary Correspondents and the remainder in the fields of selected cultivators. For various reasons, among the chief of which were that the seed being delayed in transit reached the cultivators late, while much of it was in bad condition, these were not generally successful. It appears, however, that the cultivators recognised the superiority of the English seed and evinced a desire to give it a further trial.

Demonstrations in growing superior varieties of potato, *viz.*, "Magnum Bonum" and "King of Potatoes," against the local bazar seed were also made in Sibsagar and Kamrup. Some of the demonstrations failed for somewhat similar reasons to those referred to in the case of Sylhet. In six centres in Kamrup the demonstrations were very successful. Potato cultivation was also demonstrated at four centres in which the crop is a new one.

The spraying of cultivators' potato fields with Bordeaux mixture as a preventive of disease was continued in the Khasi and Jaintia Hills district; 12 acres were sprayed as against 9 in the previous year. Unfortunately the majority of the cultivators were unwilling to bear the cost of spraying crops which to all appearance were, owing to unfavourable weather, already doomed to partial failure. Two demonstrations of potato cultivation were made in the Khasi and Jaintia Hills, in places where potatoes are not generally grown.

In the Lushai Hills 12 maunds of "Magnum Bonum" and "King of Potatoes" obtained from the Shillong Farm were planted in March 1914 in the Government garden at Durtlang. The plants were attacked by cut-worms and the crops suffered from the disease known as "Phytophthora." The seeds of these varieties which were supplied to Lushais were also attacked by the same disease. The rains crop for the year under report was practically a failure. The winter crop planted in two gardens is reported to have been destroyed by procupines.

Four Lushai boys were under training in the Government garden.

An experiment was made at Heneima and adjacent places in the Naga Hills with a view to start potato cultivation, a demonstrator being sent for the purpose from the Khasi Hills. In the North-East Frontier the seed potatoes supplied from Shillong did well.

Implements.

24. Six Meston ploughs were sent out in Sibsagar and Kamrup for demonstration in villages. The demonstrators showed the cultivators how to use the plough and many of them tried it themselves. Five ploughs were sold in Kamrup and two in Lakhimpur. As they are light, cheap and relatively efficient, a rapid extension in their use may be expected in the near future.

Terrace cultivation.

25. In the Naga Hills there are now terraces in 16 areas in Mokokchang, 4 of which were constructed in the previous year, and in one in the Sadr subdivision. The work was carried out under the supervision of Angamis who also supervised the cultivation; the crops raised were fairly good.

In the Lushai Hills terraces were tried in the same two villages as in last year and fair crops obtained. A small party of Lushai chiefs will this year be deputed to the Naga Hills to learn the method of terrace cultivation. Owing to the early cessation of the rains, the crop of wet rice at Champhai and North Vanlaiphai during the year was a short one. Two Angamis were sent from Kohima to the Central and Western Sections of the North-East Frontier with a view to introducing terraced cultivation there. After improving the old terraces and fields and making new ones they transplanted them. The experimental wet rice cultivation at Rotung was a partial failure, but it has been continued.

Terrace cultivation in the Khasi Hills having proved a failure no new experiments were made. With a view to introducing this system of cultivation in the Garo Hills a proposal was made to start an experiment at Dhamalguri, but this could not be taken up during the year. The agricultural demonstrator was engaged in supervising a terracing experiment which was undertaken by the Deputy Commissioner, besides initiating other demonstration work in the district and familiarising himself with local agricultural conditions and crops.

Fruit.

26. Demonstrations in fruit culture are being vigorously pushed on in the Lushai Hills. About 5,000 orange plants were raised from the seed obtained locally last year; of these 400 were sent to Lungleh subdivision and 350 sold to Lushais and others. Many of the plants were unfortunately destroyed by insects and there are now only 345 left. About 2 lbs. of orange seed was obtained from the Khasi Hills; it germinated well. The Assistant Instructor distributed about 400 orange plants. More than one thousand pineapple shoots were sold to Lushais. Both oranges and pineapples are now on sale in the local markets. Two hundred cuttings of tapioca plants were also distributed. They did well and the produce was sold at Aijal. The Superintendent remarks that the cultivation of tapioca will be encouraged, as it would be a useful food when next there is scarcity.

The demonstrators in the Khasi Hills were engaged in grafting fruit trees and many villages were visited by them. Three hundred and sixteen oranges were budded and 127 pears, 44 apple, 61 peach, 61 plum and 44 apricot grafts were made during the year.

Demonstration by Honorary Correspondents.

27. Babu Jnan Chandra Roy, Honorary Correspondent of Nowgong, was supplied with 3,000 sugarcane cuttings of B 147 variety He planted them in a plot of rich soil. They are reported to be growing exceptionally well; the Honorary Correspondent expresses his regret that he did not get a larger supply. He also cultivated 12 *bighas* of land with jute seed from Bengal. It has done well and its growth is more luxuriant than that of the jute grown by his neighbours.

Srijut Narayan Barua, Honorary Correspondent, Nakachari, continued his paddy demonstrations and planting experiments. On one plot manured with 3 maunds per acre of bonemeal he obtained 1,353 lbs. of paddy per acre, as against 1,275 lbs. with flour phosphate and 1,236 lbs. on an untreated plot. The results of his planting experiments also emphasized the value of planting a smaller number of seedlings than is customary.

Srijut Pithambor Saikia, Mauzadar of Khowang, who is an Honorary Correspondent, laid out a paddy demonstration using bonemeal *versus* cowdung *versus* no manure: the result is being observed this year.

Srijut Thaneswar Sarma Barthakur of Mohokuti, Sibsagar, planted B147 cane alongside the local variety, and obtained from the plant cane crops a net profit of Rs. 151 as against Rs. 23 per acre for the local variety. The ratoon crops which followed also showed a very much greater profit per acre.

Srijut Debeswar Gosain of Barpathar, an associate of this Department, carried out demonstrations with B 376 and Kalapura varieties of sugarcane. He planted 800 cuttings of each in an area of 2 *kathas* or nearly $\frac{2}{15}$ of an acre without any manure and found that B 376 gave better yields than the local cane.

Maulvi Abdur Rahim Chaudhury, Honorary Correspondent of Sultanpur in Sylhet, made experiments with bonemeal and potatoes supplied by this Department.

U Bordhon Roy Kanti, an Honorary Correspondent in the Khasi Hills, reared silk worms and distributed them to his neighbours for experiments in silk-rearing.

Section II.—Aid to the Public.

Fungus diseases.

28. Operations against orange blight were continued being confined to the budding of oranges on old limes and wild citrus stocks. Up to date no signs of disease are apparent on any of the oranges so budded. For want of citrus nurseries this work cannot be pushed on as fast as is wished.

Spraying with Bordeaux mixture in the *pan* gardens on the southern slopes of the Jaintia Hills, with a view to eliminating disease, has been going on for the past few years. During this year specimens of diseased plants were sent to the Imperial Mycologist, Pusa, who examined them and deputed an Assistant to make experiments on the spot. It is proposed to make further investigation in the rains.

Seed supply, etc.

29. During the year the following seeds, manures and implements were sold from the Seed Depôt at Gauhati :—

Seed	230 mds., of which 185 mds., were seed potatoes, 14mds. paddy and 7 mds. maize.
Manure	6 mds. 30 seers. (bonemeal).
Implements	22, of which 13 were sugarcane mills and 7 Meston ploughs.

Among other seeds which were sold may be mentioned *joha*, oats, *jowar*, *khesari* and groundnuts. There was practically no demand for jute seed during the year. In addition to the above, seeds and manures to the value of over Rs. 560 were distributed for demonstration purposes and to Government farms.

From the Upper Shillong Farm the following were issued during the year :—

Seed potatoes	1,062 maunds.
Oilcake	25 seers.
Rhubarb roots	22
Asparagus roots	10
Strawberry plants	100
Pear grafts	36
Apple grafts	14
Turnwrest plough with link chain (30 ft.)	1
Spring harrow	2
Wheel cultivator and plough	1
New Model Planet Jr. Seed drill	1

The Agricultural Inspector, Khasi and Jaintia Hills, supplied the following :—

Orange seeds	2 lbs.
„ seedlings	2,511
Lime „	6
Tezpat „	50
Ceylon pineapples	12 crowns.
Spraying machine	1

The bone grinding installation at the Upper Shillong Farm began operations during the year. Some 336 maunds of bones collected in the hills were crushed; they yielded 305 maunds of bonemeal. This was sold at Rs. 3-8 per maund at Shillong against Rs. 5-2-6 charged in the Calcutta market. Three new centres were opened for the sale of bonemeal and 301½ maunds were sold against 141 maunds last year. The result is most satisfactory; the practice of manuring with bonemeal is reported to be steadily increasing among the cultivators in these hills. Nine temporary depôts for the sale of seed potatoes were open during the year in the Khasi Hills. The total quantity sold was 678 maunds.

Section III.—Sericulture.

In the plains.

30. The greater part of Rai Bahadur B. C. Basu's report on the silk industry of Assam was published during the year. One chapter, however, remains to be written. This cannot be done pending receipt of a report by Mr. Hoogewerf, Principal of the Government Weaving Institute at Serampore. The recommendations which have been made by Mr. Basu are under consideration.

In the Khasi Hills.

31. The rearing of silk worms at the old Government Fruit Farm near Umlyngka continued to be carried on by the Roman Catholic Mission. The construction of the new rearing house on the farm, for which a sum of Rs. 1,500 was contributed by this Administration, has been finished. A grant of Rs. 50 per mensem for 5 months of the year was given to the Mission to enable them to carry on their sericultural work. One ounce of French Var and 3 ounces of Delonca eggs were reared in the new rearing house. Both kinds of eggs gave satisfactory results and the cocoons were healthy looking. It is understood that the weight of green cocoons amounted to about 3½ maunds from which 1 maund or so of raw silk might be obtained. Frosty weather and hailstorms caused considerable damage to the mulberry leaves and there was scarcity of food material. No diseased worms were found this year.

Section IV.—Agricultural Shows and Exhibitions.

32. The Agricultural Show for the Khasi Hills was held at Shillong on the 1st September 1914. As in the previous year, it was a purely Agricultural Show, no flowers being included. There were numerous exhibits and the attendance was large. The Show was a great success.

The annual Agricultural Meeting, which was attended by a large number of those interested in agriculture in the Khasi Hills, was held at the Upper Shillong Farm in July 1914. The visitors were shown over the farm and took a great interest in what they saw, more especially in the new varieties of potatoes which were being harvested, in the improved implements and the mill for grinding bonemeal. There was a useful discussion on various agricultural questions.

Section V.—Agricultural Associates and Honorary Correspondents.

33. At the close of the year there were 26 correspondents against 28 in the previous year; one of them held the post of Associate. A list of Honorary Correspondents is appended to this report. The names of six correspondents were removed from the list, as they failed to evince much interest in the work, while four new appointments were made during the year. An account of the chief work done by some of the correspondents is given in paragraph 26. As in last year, many of them have failed to submit any account of what they have done, and probably most of these have not done much. I need hardly say that various officers of the Department did what they could with a view to keeping in touch with the Honorary Correspondents.

CHAPTER V.

OPERATIONS FOR THE IMPROVEMENT OF LIVE-STOCK.

Cattle-breeding.

34. Breeding of Patna and cross-bred cattle at the Upper Shillong Farm was continued. The herd at the close of the year consisted of 74 head against 67 in the preceding year. Twelve bulls were sold during the year, five in the Khasi Hills, four in the plains of Assam and the remaining three in Bengal. More could have been sold had they been available. One bull was lent to the Co-operative Dairy at Sunamganj, but it died of rinderpest. The total yield of milk during the year amounted to 2,830 gallons and the income from its sale to Rs. 1,052-15. Patna cattle and these cattle crossed with Khasia and Bhutia breeds have proved remarkably well adapted to the climate of the Khasi Hills. Some

of the cows on the farm yielded a maximum of over 20 lbs. of milk in a day, while one gave as much as 28 lbs. It is reported that there is a great demand for cows bred at Upper Shillong and that they might easily fetch as much as Rs. 200 each ; at present none can be spared for sale. One of the two breeding bulls on the farm has become too old for service and steps have been taken to replace him by an Ayrshire bull.

A scheme for importing through the Political Agent, Manipur, 50 selected Manipuri bulls towards the end of this financial year has recently been sanctioned. It is proposed to supply them at a small price, subject to certain conditions, to such tea planters and others as are likely to see that good use is made of them.

The scheme is intended to be experimental; whether work on similar lines will be continued in future years will depend mainly on how far it proves to be a success. If the Political Agent, Manipur, is able to improve the Manipuri stock by cross-breeding, he hopes to be able to supply the improved stock in place of the pure Manipuri. Full details of the scheme have not yet been worked out.

Mr. Blackwood's report on the special inquiry which he made as to cattle-breeding is expected shortly. When that is received, the question of establishing a large cattle-breeding farm in Assam will be taken up.

Sheep breeding.

35. The results of sheep-breeding have been extremely disappointing. The flock has gradually dwindled down. There were only 87 sheep at the close of the year as against 136 at the end of the previous year. The decrease was mainly due to a disease known as *Strongylosis*. Apart from the outbreak of this disease, there are other difficulties which stand in the way of successful breeding of sheep in the Shillong Farm, the chief of which is want of pasturage during the winter. The original Dumba stock is now nearly extinct and the cross between the Dumba and the native sheep has proved extremely susceptible to disease. As regards the production of wool, the experiment has also been a failure; the heaviest fleeces do not exceed a pound in weight. It is probable that the attempt to breed sheep in the neighbourhood of Shillong, at least in its present form, will be given up at an early date.

Poultry-breeding.

36. Poultry-breeding under Government control continued at Aijal under the supervision of the Superintendent, Lushai Hills. During the year 3,814 eggs were obtained from imported birds, or which 2,718 were sold to Lushais and others at two annas each and 966 were used fof hatching. From these 966 eggs, 507 chickens were obtained, of which 322 survivedr There was no sale of fowls during the year.

On the 1st April 1915 there were approximately 6,473 birds in the district, of which 5,941 were in villages and 532 on the farm. There was a decrease in the number of birds in the villages on account of a disease which attacked both the imported and the Lushai fowls. Experiments are now being made by crossing one or two of the more distinctive Lushai breeds with English breeds in the hope of evolving a bird sufficiently hardy to live in a Lushai village.

The total sale proceeds of the farm amounted to Rs. 383-14 against Rs. 496-12-6 of last year, while the total cost was Rs. 1,491-11 against Rs. 1,598 0-5. The poultry farm was not a paying concern but it was established for the purpose of improving the breed of fowls in the district. As the stock required renewal an arrangement was made through the Agricultural Adviser to the Government of India to import some English fowls; on account of the war, however, they could not be obtained.

With a view to improving the quality of poultry in the Khasi Hills and other parts of the Province a proposal has been made for the establishment of a poultry breeding station in Shillong. Financial considerations, however, stand in the way of further action being taken for the present.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Agricultural publications.

37. The following bulletins and leaflets were published in the course of the year :—

(1) *Leaflet No.* 1 *of* 1914.—Proper conservation of cattle dung and urine.

(2) *Leaflet No.* 2 *of* 1914.—Instructions for collecting and forwarding specimens of insects damaging crops.

(3) *Leaflet No.* 3 *of* 1914.—Bonemeal as manure for wet rice land in the Khasi and Jaintia Hills.

(4) *Bulletin No.* 1 *of* 1914.—Preserving fodder for winter in the Khasi Hills.

(5) *Bulletin No.* 2 *of* 1914.—Bordeaux mixture as a preventive of the potato disease.

(6) *Bulletin No.* 3 *of* 1914.—Potato cultivation in the Assam Hills.

All of these have been published in English and will shortly be issued in the vernacular. A few more pamphlets are in the press and will be published this year Arrangements have been made for their wide circulation through Deputy Commissioners.

Reports on the work of each agricultural station and of agricultural demonstrations are published annually in the autumn. Revised rules for the supply of seeds, implements and manures at reduced rates to associates and correspondents and a price list of the Seed Depôt at Gauhati were also issued during the year.

The results of Mr. Meggitt's observation on soil investigations have been published in the form of a memoir of the Imperial Department of Agriculture entitled "Studies of an Acid soil in Assam."

Supply of information.

38. Honorary Correspondents were supplied free with copies of all departmental publications and reports and were furnished with information and advice on agricultural matters when required. Some of them also get the quarterly agricultural journal of India at concession rates. Various requisitions for information relating to agriculture, sericulture, fruit culture and industry in the province were received from private individuals and concerns and complied with.

CHAPTER VII.

MISCELLANEOUS.

Weaving.

39. This was the second year during which the Weaving Master Babu Nani Gopal Mitra worked. His demonstrations were mainly confined to a few selected centres, *viz.*, Kubazpur, Sylhet Jail, Sadarasi, Beani Bazar, Nilambazar, Khowang, Polasbari and its neighbourhood, Barpeta, Nowgong and Gauhati. Most of these places were visited by him two or three times during the year. The demonstrations given by him were chiefly in the use of the automatic fly-shuttle and other improved looms and appliances. As stated in last year's report, it has been demonstrated that the efficiency of the native loom can be greatly increased at a cost of about Rs. 10 by attaching to it a fly-shuttle slay. There is a wide field of useful work open in the introduction of the use of the fly-shuttle and this seems to be the direction in which his energies may best be turned.

Among the improvements which the Weaving Master is trying to introduce may also be mentioned the drop-box attached slay, *dhotie*, bordering attachment, improved shuttles and peg warping. His work, in which the demonstration of the use of the fly-shuttle loom took a prominent place, appears to have been greatly appreciated.

It is gratifying to note that the number of fly-shuttle looms at the Sylhet Jail has increased from 1 to 20 and that the use of warping mills has been introduced since the Weaving Master paid his first visit. It appears that at various centres the people have expressed their intention to obtain the improved looms; arrangements are being made for them to do so. At Nilambazar considerable difficulty was experienced in getting the weavers to part with a fly-shuttle loom which had been lent to them; the Weaving Master, perhaps rightly, thinks that this shows the keen desire of the people to learn, though the form in which it manifested itself was somewhat inconvenient.

The introduction of improvements must necessarily be a matter of time. After a year or two it will be interesting to have some definite idea of the extent to which the use of the fly-shuttle loom has been introduced.

Co-operative Societies and Agriculture.

40. Last year I dealt with this subject at some length. There is practically nothing new to be recorded. At present the main obstacle to the Departments of Agriculture and Co-operation doing more in common is that both, especially the latter, are undermanned. It would, perhaps, be unsafe for that Department at present to undertake much work of a more complicated kind than that connected with pure

Credit Societies. It might well supply good seed to members of societies and this may, I think, be done before long; unfortunately, however, it will be years before the Agricultural Department is able to supply good paddy seed, while at present the demand for sugarcane is in excess of the supply.

The obstacles which I have mentioned are, however, likely to disappear as time goes on.

A little work has been done this year in the direction of assisting the weaving industry by co-operation and a few Co-operative Societies have been supplied with iron sugarcane-crushing mills. While it would be idle to pretend that anything substantial has been effected, I think that the reason has been sufficiently explained. The importance of the matter is fully realised, and when practicable every effort should and doubtless will be made to further it.

41. It is, I think, clear from the Report that considerable advance has been made by the Department.

General progress.

The most disappointing feature of the year's work is the temporary failure in the scheme of paddy selection at the Karimganj Farm. A great deal of careful and, I think, valuable work had been done there; it was particularly unfortunate that abnormal floods practically destroyed the whole of it.

There is, in my opinion, no doubt that we should persevere with this work.

As regards the Kamrup Sugarcane Experiment Station, it is too early to express a definite opinion. The season was unusually unfavourable. A start has been made and it is hoped that the experience which has been gained will help us to surmount the chief obstacles which have been encountered this year.

As already observed, the Fruit Experiment Station at Shillong has made satisfactory progress.

It is an indisputable fact that what has been done at the Upper Shillong Farm in the matter of the cultivation of potatoes has been of immense benefit to the people of the Khasi and Jaintia Hills. This year's report shows that the Department is making efforts to extend the cultivation of this crop in the plains, and I have little doubt that great progress will be made in this direction during the current year. Another very satisfactory feature of our work in these hills is the extent to which the use of bonemeal as a manure is increasing. In the matter of cattle-breeding little has been done at present, but the demand for bulls and cows bred at the farm is a hopeful sign.

Very valuable work has been done at Jorhat with sugarcane. The growing popularity of our sugarcane with the cultivators is most encouraging.

Due allowance being made for the conservatism of Assamese cultivators, the extent to which they have adopted Meston ploughs and iron sugarcane-crushing mills, though small in itself, is, I think, not unsatisfactory. The increased receipts of the Department on account of the sale of seeds, implements, etc., and farm produce bears evidence to the fact that its work is extending on useful lines.

One of the main needs of the Department is an adequate staff. The appointment of a second Deputy Director of Agriculture is awaiting sanction. We have now an Agricultural Supervisor for each of the two divisions and five Agricultural Inspectors and 8 demonstrators in the districts. Steps have been taken by which the supply of men suitable for the post of Agricultural Inspector and demonstrator will be largely increased. A scheme showing the staff required by the province has been drawn up; though our present staff falls very far short of this, a great advance has been made.

I feel very strongly that the Department should, for the present at least, concentrate its attention mainly on the chief staple products of the province. When our staff is at its full strength, we may well pay more attention to matters of minor importance; at present we have to guard against dissipating our energies on these. Among the chief staple products paddy takes the first place.

42. The services of Mr. Birt, Deputy Director of Agriculture, and of Mr. Meggitt, Agricultural Chemist, have so frequently been commended that I need do little more than express my agreement with what my predecessors have said. It is hoped that Mr. Birt's absence will be a short one. Though much of the work which Mr. Meggitt is now doing is new to him, he has shown capacity and energy in dealing with it.

Notice of services.

Rai Bahadur B. C. Basu is likely soon to enter upon a well-earned period of retirement. He has been of great help to me. With wide practical and theoretical knowledge he combines a sound common sense which makes his advice of great value. His services will be much missed.

Mr. Chaston, Manager of the Kamrup Farm, has done good practical work in conditions of considerable difficulty and discomfort.

M. Fazlul Haq Ahmad, Agricultural Supervisor, has continued to work well throughout the year.

The Superintendent of the Shillong Farm, U Herrick Singh, has, as usual, done good practical work.

Srijut Binaram Das, Superintendent of the Jorhat Farm, has continued to show improvement in his work.

Babu Satyendra Chandra Datta, Agricultural Inspector of Kamrup, has done well ; he has lately been confirmed in his post.

U Harry Singh, Probationary Agricultural Inspector of Khasi and Jaintia and Garo Hills districts, has done much good work in connection with demonstrations and with the manufacture and sale of bonemeal.

Babu Binode Behari Das, Probationary Agricultural Inspector of Sylhet, is said to have shown some improvement in his work ; he did well when in charge for some months of the Karimganj Farm.

Babu Surendra Nath Gupta is sreported to have done very good work at the Karimganj Farm. He has lately been promoted to the post of Agricultural Inspector.

The demonstrators are reported to have worked satisfactorily on the whoe Srijut Nabin Chandra Barua acted as Superintendent of the Jorhat Farm for three months and appears to have done well at the work. Srijut Sarvananda Sarma, Clerk at the Kamrup Farm, is reported to deserve mention for his very painstaking work at accounts and the valuable assistance given by him in the field.

My thanks are due to my office staff and especially to the Head Assistant, Babu Dinesh Chandra Das, who has given much help in the compilation of this Report.

A. R. EDWARDS,

Director of Land Records and Agriculture, Assam.

APPENDIX I.

List of Honorary Correspondents of the Department of Agriculture in Assam (the names of correspondents who are also associates are marked).*

SYLHET.

1. D. Ferguson, Esq., Dhamai tea estate, post office Dakhinbag.
2. Babu Girija Nath Biswas, post office Baniachang.
3. „ Hara Kishore Gupta, post office Pail, Habiganj.
4. „ Pavitra Nath Das, post office Beani Bazar.
5. „ Raj Kumar Nandi, Sylhet.
6. „ Bidya Kumar Chowdhury, Sunamganj.
7. „ Baisnab Charan De, post office Kaliganj Bazar.
8. Maulvi A. M. Chowdhury, zamindar, Kanihati, post office Hazipur, South Sylhet.
9. Maulvi Abdur Rahim Chowdhury, Zamindar, village Sultanpur, post office Jalalpur, Sylhet.

CACHAR.

10. Babu Sarada Charan Chakravarty, B A., Assistant Inspector of Schools, Silchar.
11. „ Bharat Chandra Chaudhury, Salchapra, Cachar.

KHASI AND JAINTIA HILLS.

12. U Job Solomon, Shillong.
13. U Kubur Singh, Mylliem.
14. U Bordhon Ray Kanti, Mahadeb, Cherrapunjee.
15. U Helikton Passah, Head Master, Upper Primary School, Jowai.

GOALPARA.

16. Babu Dijesh Chandra Chakravarti, Manager, Gauripore estate.
17. „ Lahit Mohan Dutta, Dhubri.

KAMRUP.

18. E. P. R. Gilman, Esq., Barduar tea estate, post office Palasbari, Kamrup.
19. Munshi Kaymubir Rahman, Gauhati.
20. „ Tayab Ali, Sonapur, Kamrup.

DARRANG.

21. Babu Jatindra Chandra Maitra, Tezpur.

NOWGONG.

22. Babu Jnan Chandra Ray, Baithulongso, post office Kampur.

SIBSAGAR.

23. Srijut Thaneswar Sarma Barthakur, Mohakuti, Sibsagar.
24. „ Debeswar Gosain, Barpathar Sugarcane Farm, post office Badlipur (Golaghat).*
25. „ Narayan Chandra Barua, Nakachari, Lahing, Jorhat.
26. „ Pithambar Saikia, Mauzadar, Khowang, post office Khowang, Lakhimpur.

APPENDIX II.

Statement showing the receipts and expenditure of the Department of Agriculture for the year ending the 30th June 1915.

Receipts.	Amount.	Expenditure.	Amount.
1	2	3	4
	Rs. a. p.		Rs. a. p.
(*a*) Sale of manure and farm produce...	4,695 15 9	(1) Superintendence	41,572 7 11
(*b*) Potatoes	1,881 7 6	(2) Agricultural instruction ...	1,167 15 11
(*d*) Other receipts	2,127 6 6	(3) Agricultural Chemist ...	3,670 5 3
(*e*) Receipts from Seed Depôt ...	1,486 14 7	(4) Experiment Stations ...	1,79,064 11 11
		(5) Agricultural demonstrations and experiments.	7,737 0 5
		(6) Public Exhibition and Fairs ...	925 4 0
		(7) Sheep and goat-breeding operations.	673 10 9
		(8) Poultry-breeding operations ...	1,686 15 3
Total Receipts	10,191 12 4	Total Expenditure ...	2,36,498 7 5

SHILLONG: Printed and published by H. H. KING, Superintendent, Assam Secretariat Printing Office,
(R. & Agri.) No. 35—500—2-11-1915.

Extract from the Proceedings of the Chief Commissioner of Assam in the Revenue Department, No. 4758R., dated the 30th October 1915.

READ—

The Report of the Department of Agriculture, Assam, for the year ending 30th June 1915.

RESOLUTION.

ONE of the most urgent needs of the Agricultural Department in this province is the provision of an adequate staff of properly trained officers, and the Chief Commissioner, therefore, observes with satisfaction that there was an increase of one Agricultural Supervisor, three Agricultural Inspectors and four Demonstrators in the number of officers actually entertained. Proposals were submitted during the year to the Secretary of State for the appointment of a second Deputy Director, and though sanction was not actually accorded and the office could not be filled during the year under review, the retention of Rai Bahadur B. C. Basu on special duty in the department provided the Director with two officers of this standing. Mr. Birt, Deputy Director of Agriculture, joined the Indian Army Reserve of Officers in May 1915, making over his work to Mr. Meggitt, the Agricultural Chemist, who could not devote himself entirely to his own duties as his laboratory has not yet been completed. The subordinate staff consisted of 24 officers as against 18 in the preceding year. This was an appreciable advance, but the staff is still very much below the real requirements of the province. The main obstacle to recruitment is the difficulty of obtaining officers with agricultural training, and, in order to increase the supply, sanction was accorded to the annual appointment of four apprentices at each of the two farms at Jorhat and Karimganj in place of two, and the number of agricultural scholarships open to natives of the province at Sabour was raised from one to four.

2. Experiments were continued at Jorhat in the effect of different manures and showed that wood ashes were of special value to *rabi* crops. The farm at Karimganj has been dedicated to experiments in the line breeding of rice, no less than 145 varieties having been tried. The abnormal floods of June and July unfortunately destroyed practically the whole results of the experiment and work will have to be started again from the beginning. At Shillong attention was principally directed to potatoes, over 1,000 maunds of which were sold as seed. This crop is now beginning to spread outside the Khasi Hills, no less than 400 maunds of seed being sent elsewhere. The farm at Khagrabari in the Kamrup district is devoted to an attempt to demonstrate whether it is or is not possible to cultivate sugarcane on a commercial scale by the use of steam tackle. Heavy rain in 1915 proved, however, very unfavourable to the experiment, as difficulties in obtaining labour and the late arrival of the steam tackle delayed the planting of the cane. Much of the young crop suffered in consequence from the waterlogging of the soil, and the area planted out up to date is considerably less than was originally estimated. The Shillong fruit garden also suffered from unfavourable climatic conditions, the trees having been seriously damaged by hail. Over 16 acres have now been planted with trees which show every prospect of doing well.

3. Useful work was done during the year in bringing to the notice of the cultivators the results of experimental work. Demonstrations were carried out which showed that a substantial net profit is to be obtained from the use of flour phosphate and bonemeal. Improved varieties of sugarcane have already established their position and no less than 70,000 sets were distributed in the Assam Valley alone. The three roller iron bullock-power-crushing mill is also rapidly rising in public estimation. The advantage of these mills was demonstrated at six centres in Kamrup with the result that 13 of them were sold. Demonstrations in potato cultivation were carried on in Sylhet, the Lushai and the Naga Hills, and the North-East Frontier. Strenuous efforts are being made to extend terrace cultivation in the hills. There are now 16 areas in the Mokokchang subdivision where terraces have been constructed, and the system has been demonstrated in the Lushai Hills and on the North-East Frontier amongst the Abors. Work will also soon be started in the Garo Hills but progress, it

is feared, will be but slow. The Angami Nagas are expert and careful terracers, pressure of population having compelled them to resort to this practice. But, where there is still sufficient land for *jhuming*, hillmen are exceedingly averse from a proposal to exchange their time-honoured methods for something new. It seems further that terrace cultivation demands more labour of the man than mere *jhuming*, and on this account alone it is not unnaturally regarded with disfavour.

4. The Chief Commissioner is much indebted to the following honorary correspondents:—Babu Jnan Chandra Roy, Srijut Narayan Barua, Srijut Pithambor Saika, Srijut Thaneswar Sarma, Srijut Debeswar Gosain, Maulvi Abdur Rahim Chaudhury and U Bordhon Roy Kanti for the assistance which they gave to the department during the year. It would be hardly possible for any patriotic inhabitant of the province to confer more lasting and solid benefits upon his countrymen than by assisting in this way to discover improved methods of agriculture, and to popularise these methods amongst the raiyats. The Chief Commissioner therefore hopes that the number of the honorary correspondents will steadily increase and that the Director of Agriculture will spare no pains to interest the local gentry in the operations of his department. Good work was done by the seed depôt at Gauhati, from which were sold 230 maunds of seed and 22 agricultural implements. Stated in these terms the outturn may perhaps seem small, but work of this kind will grow rapidly in importance, and when Gove nment is able to provide an Agricultural officer for each district, we may look for a rapid extension of new and improved methods.

5. The Chief Commissioner takes much interest in all projects for the improvement of the live-stock of the province, and he is glad to learn that there is so great a demand for cows bred at the Upper Shillong farm. Unfortunately the very abnormal financial situation created by the disastrous floods in the Surma Valley has necessitated the postponement of the scheme for the improvement of live-stock by the introduction of selected bulls from Manipur. Sheep breeding up to date has proved a failure at Shillong, but the question is one of some importance from the point of view of food-supply, and the Chief Commissioner hopes that it will not be abandoned without a further effort. Excellent work has been done in connection with poultry breeding in the Lushai Hills, and a proposal to start a poultry farm at Shillong is under consideration.

6. The Chief Commissioner is pleased to see that six leaflets and bulletins were issued during the year, and he hopes that this system of imparting information will be further developed in the future. The weaving master works under the Director of Agriculture and Sir Archdale Earle is glad to learn that his efforts were again much appreciated and that improved methods and implements are gradually gaining ground.

7. The thanks of the Chief Commissioner are due to Messrs. McSwiney and Edwards for the care devoted to the department during the year. Mr. Birt is a great loss to Agriculture, but Sir Archdale Earle was unable to oppose his patriotic desire to help his country at this great crisis. Fortunately Mr. Meggitt was at hand to carry on Mr. Birt's work and he devoted himself to his new duties with all his energy, while Rai Bahadur B. C. Basu brought to the department an intimate knowledge of the agricultural conditions of Assam. These were the Director's principal lieutenants, but the Chief Commissioner has also read with pleasure the account of the good work done by other officers.

His special thanks are due to Mr. C. H. Holder for his energetic and careful supervision of the experimental fruit garden at Shillong.

ORDERED that a copy of this Resolution and of the report, together with the Shillong fruit station report, be published in the *Assam Gazette* for general information.

By order of the Chief Commissioner of Assam,

B. C. ALLEN,

Chief Secretary to the Chief Commissioner of Assam.

A. S. P. O. (R. & Agri.) No. 38—500—1-11-1915.—A. E. R.

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